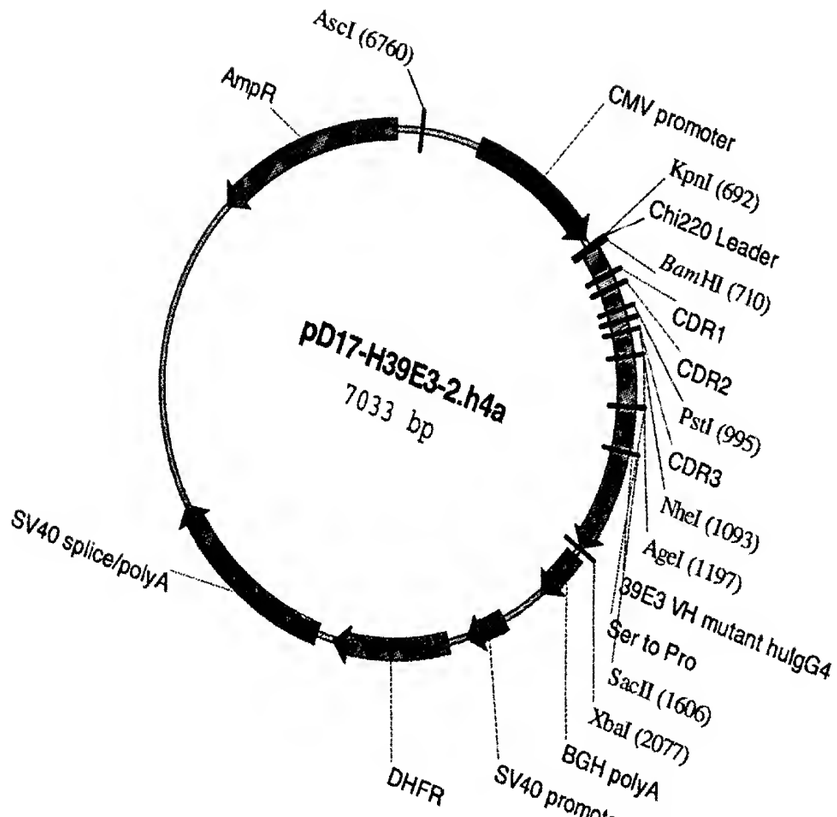
pD17-H39E3-2.h4a
7033 bp
AscI (6760)
AmpR
CMV promoter
KpnI (692)
Chi220 Leader
BamHI (710)
CDR1
CDR2
PstI (995)
CDR3
NheI (1093)
AgeI (1197)
39E3 VH mutant hulgG4
Ser to Pro
SacII (1606)
XbaI (2077)
BGH polyA
SV40 promoter, enhancerless
DHFR
SV40 splice/polyA

FIG. 1

```
   1    CGATGTACGG GCCAGATATA CGCGTTGACA TTGATTATTG ACTAGTTATT
        GCTACATGCC CGGTCTATAT GCGCAACTGT AACTAATAAC TGATCAATAA
  51    AATAGTAATC AATTACGGGG TCATTAGTTC ATAGCCCATA TATGGAGTTC
        TTATCATTAG TTAATGCCCC AGTAATCAAG TATCGGGTAT ATACCTCAAG
 101    CGCGTTACAT AACTTACGGT AAATGGCCCG CCTGGCTGAC CGCCCAACGA
        GCGCAATGTA TTGAATGCCA TTTACCGGGC GGACCGACTG GCGGGTTGCT
 151    CCCCCGCCCA TTGACGTCAA TAATGACGTA TGTTCCCATA GTAACGCCAA
        GGGGGCGGGT AACTGCAGTT ATTACTGCAT ACAAGGGTAT CATTGCGGTT
 201    TAGGGACTTT CCATTGACGT CAATGGGTGG ACTATTTACG GTAAACTGCC
        ATCCCTGAAA GGTAACTGCA GTTACCCACC TGATAAATGC CATTTGACGG
 251    CACTTGGCAG TACATCAAGT GTATCATATG CCAAGTACGC CCCCTATTGA
        GTGAACCGTC ATGTAGTTCA CATAGTATAC GGTTCATGCG GGGGATAACT
 301    CGTCAATGAC GGTAAATGGC CCGCCTGGCA TTATGCCCAG TACATGACCT
        GCAGTTACTG CCATTTACCG GGCGGACCGT AATACGGGTC ATGTACTGGA
 351    TATGGGACTT TCCTACTTGG CAGTACATCT ACGTATTAGT CATCGCTATT
        ATACCCTGAA AGGATGAACC GTCATGTAGA TGCATAATCA GTAGCGATAA
 401    ACCATGGTGA TGCGGTTTTG GCAGTACATC AATGGGCGTG GATAGCGGTT
        TGGTACCACT ACGCCAAAAC CGTCATGTAG TTACCCGCAC CTATCGCCAA
 451    TGACTCACGG GGATTTCCAA GTCTCCACCC CATTGACGTC AATGGGAGTT
        ACTGAGTGCC CCTAAAGGTT CAGAGGTGGG GTAACTGCAG TTACCCTCAA
 501    TGTTTTGGCA CCAAAATCAA CGGGACTTTC CAAAATGTCG TAACAACTCC
        ACAAAACCGT GGTTTTAGTT GCCCTGAAAG GTTTTACAGC ATTGTTGAGG
 551    GCCCCATTGA CGCAAATGGG CGGTAGGCGT GTACGGTGGG AGGTCTATAT
        CGGGGTAACT GCGTTTACCC GCCATCCGCA CATGCCACCC TCCAGATATA
 601    AAGCAGAGCT CTCTGGCTAA CTAGAGAACC CACTGCTTAC TGGCTTATCG
        TTCGTCTCGA GAGACCGATT GATCTCTTGG GTGACGAATG ACCGAATAGC
                                                   Chi220 Leader
                                                   ~~~~~~~~~
                                              KpnI
                                              ~~~~~~~
                                                    M  D  W  .
 651    AAATTAATAC GACTCACTAT AGGGAGACCC AAGCTTGGTA CCATGGACTG
        TTTAATTATG CTGAGTGATA TCCCTCTGGG TTCGAACCAT GGTACCTGAC
                         Chi220 Leader
        ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                BamHI
                ~~~~~~~
        .  T  W  R  I  L  F  L  V  A  A  A  T  G  A  H  S  E  .
 701    GACCTGGAGG ATCCTCTTCT TGGTGGCAGC AGCAACAGGT GCCCACTCCG
        CTGGACCTCC TAGGAGAAGA ACCACCGTCG TCGTTGTCCA CGGGTGAGGC
        .  V  Q  L  V  E  S  G  G  G  L  V  Q  P  G  G  S
 751    AAGTACAACT GGTGGAGTCT GGAGGAGGTT TGGTGCAACC TGGGGGTTCT
        TTCATGTTGA CCACCTCAGA CCTCCTCCAA ACCACGTTGG ACCCCCAAGA
                                                   CDR1
                                              ~~~~~~~~~~~~~
         L  R  L  S  C  A  A  S  G  F  T  F  S  D  Y  W  M  .
 801    CTGCGACTCT CTTGTGCAGC CTCGGGATTC ACTTTCAGTG ACTACTGGAT
        GACGCTGAGA GAACACGTCG GAGCCCTAAG TGAAAGTCAC TGATGACCTA
        CDR1                                              CDR2
        ~~~~                                              ~~~~
        .  S  W  V  R  Q  A  P  G  K  G  L  E  W  V  A  D  I  .
 851    GAGCTGGGTT CGTCAGGCGC CTGGAAAGGG CCTGGAGTGG GTTGCAGATA
        CTCGACCCAA GCAGTCCGCG GACCTTTCCC GGACCTCACC CAACGTCTAT
```

FIG. 2A

```
                                CDR2
                ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                · K N D  G S Y  T N Y A  P S L  T N R
 901    TTAAAAATGA TGGCAGTTAC ACAAACTATG CACCATCCCT AACGAATCGA
        AATTTTTACT ACCGTCAATG TGTTTGATAC GTGGTAGGGA TTGCTTAGCT
                                                  PstI
                                                 ~~~~~~~
                 F  T  I  S  R  D  N  A  K  N  S  L  Y  L  Q  M  N ·
 951    TTCACAATCT CCAGAGACAA TGCCAAGAAC TCCCTGTACC TGCAGATGAA
        AAGTGTTAGA GGTCTCTGTT ACGGTTCTTG AGGGACATGG ACGTCTACTT
                                                       CDR3
                                                      ~~~~~~~
                · S  L  R  A  E  D  T  A  V  Y  Y  C  A  R  E  L  T ·
1001    CTCTCTGAGA GCTGAGGACA CAGCCGTTTA TTACTGTGCT AGAGAACTAA
        GAGAGACTCT CGACTCCTGT GTCGGCAAAT AATGACACGA TCTCTTGATT
          CDR3
        ~~~~~~~~
                                                    NheI
                                                   ~~~~~~
                · G  T  W  G  Q  G  T  M  V  T  V  S  S  A  S  T
1051    CTGGGACTTG GGGCCAAGGA ACCATGGTCA CAGTCTCCTC AGCTAGCACC
        GACCCTGAAC CCCGGTTCCT TGGTACCAGT GTCAGAGGAG TCGATCGTGG
                 K  G  P  S  V  F  P  L  A  P  C  S  R  S  T  S  E ·
1101    AAGGGCCCAT CCGTCTTCCC CCTGGCGCCC TGCTCCAGGA GCACCTCCGA
        TTCCCGGGTA GGCAGAAGGG GGACCGCGGG ACGAGGTCCT CGTGGAGGCT
                                                        AgeI
                                                       ~~~~~
                · S  T  A  A  L  G  C  L  V  K  D  Y  F  P  E  P  V ·
1151    GAGCACAGCC GCCCTGGGCT GCCTGGTCAA GGACTACTTC CCCGAACCGG
        CTCGTGTCGG CGGGACCCGA CGGACCAGTT CCTGATGAAG GGGCTTGGCC
        AgeI
        ~
                · T  V  S  W  N  S  G  A  L  T  S  G  V  H  T  F
1201    TGACGGTGTC GTGGAACTCA GGCGCCCTGA CCAGCGGCGT GCACACCTTC
        ACTGCCACAG CACCTTGAGT CCGCGGGACT GGTCGCCGCA CGTGTGGAAG
                 P  A  V  L  Q  S  S  G  L  Y  S  L  S  S  V  V  T ·
1251    CCGGCTGTCC TACAGTCCTC AGGACTCTAC TCCCTCAGCA GCGTGGTGAC
        GGCCGACAGG ATGTCAGGAG TCCTGAGATG AGGGAGTCGT CGCACCACTG
                · V  P  S  S  S  L  G  T  K  T  Y  T  C  N  V  D  H ·
1301    CGTGCCCTCC AGCAGCTTGG GCACGAAGAC CTACACCTGC AACGTAGATC
        GCACGGGAGG TCGTCGAACC CGTGCTTCTG GATGTGGACG TTGCATCTAG
                · K  P  S  N  T  K  V  D  K  R  V  E  S  K  Y  G
1351    ACAAGCCCAG CAACACCAAG GTGGACAAGA GAGTTGAGTC CAAATATGGT
        TGTTCGGGTC GTTGTGGTTC CACCTGTTCT CTCAACTCAG GTTTATACCA
                 P  P  C  P  P  C  P  A  P  E  F  L  G  G  P  S  V ·
1401    CCACCTTGCC CACCTTGCCC AGCACCTGAG TTCCTGGGGG GACCATCAGT
        GGTGGAACGG GTGGAACGGG TCGTGGACTC AAGGACCCCC CTGGTAGTCA
                · F  L  F  P  P  K  P  K  D  T  L  M  I  S  R  T  P ·
1451    CTTCCTGTTC CCCCCAAAAC CCAAGGACAC TCTCATGATC TCCCGGACCC
        GAAGGACAAG GGGGGTTTTG GGTTCCTGTG AGAGTACTAG AGGGCCTGGG
                · E  V  T  C  V  V  V  D  V  S  Q  E  D  P  E  V
1501    CTGAGGTCAC GTGCGTGGTG GTGGACGTGA GCCAGGAAGA CCCCGAGGTC
        GACTCCAGTG CACGCACCAC CACCTGCACT CGGTCCTTCT GGGGCTCCAG
                 Q  F  N  W  Y  V  D  G  V  E  V  H  N  A  K  T  K ·
1551    CAGTTCAACT GGTACGTGGA TGGCGTGGAG GTGCATAATG CCAAGACAAA
        GTCAAGTTGA CCATGCACCT ACCGCACCTC CACGTATTAC GGTTCTGTTT
```

FIG. 2B

```
          SacII
          ~~~~~~
          · P  R  E    E  Q  F  N    S  T  Y    R  V  V    S  V  L  T ·
1601      GCCGCGGGAG GAGCAGTTCA ACAGCACGTA CCGTGTGGTC AGCGTCCTCA
          CGGCGCCCTC CTCGTCAAGT TGTCGTGCAT GGCACACCAG TCGCAGGAGT
          · V  L  H    Q  D  W    L  N  G  K    E  Y  K    C  K  V
1651      CCGTCCTGCA CCAGGACTGG CTGAACGGCA AGGAGTACAA GTGCAAGGTC
          GGCAGGACGT GGTCCTGACC GACTTGCCGT TCCTCATGTT CACGTTCCAG
           S  N  K  G    L  P  S    S  I  E    K  T  I  S    K  A  K ·
1701      TCCAACAAAG GCCTCCCGTC CTCCATCGAG AAAACCATCT CCAAAGCCAA
          AGGTTGTTTC CGGAGGGCAG GAGGTAGCTC TTTTGGTAGA GGTTTCGGTT
          · G  Q  P    R  E  P  Q    V  Y  T    L  P  P    S  Q  E  E ·
1751      AGGGCAGCCC CGAGAGCCAC AGGTGTACAC CCTGCCCCCA TCCCAGGAGG
          TCCCGTCGGG GCTCTCGGTG TCCACATGTG GGACGGGGGT AGGGTCCTCC
          · M  T  K    N  Q  V    S  L  T  C    L  V  K    G  F  Y
1801      AGATGACCAA GAACCAGGTC AGCCTGACCT GCCTGGTCAA AGGCTTCTAC
          TCTACTGGTT CTTGGTCCAG TCGGACTGGA CGGACCAGTT TCCGAAGATG
           P  S  D  I    A  V  E    W  E  S    N  G  Q  P    E  N  N ·
1851      CCCAGCGACA TCGCCGTGGA GTGGGAGAGC AATGGGCAGC CGGAGAACAA
          GGGTCGCTGT AGCGGCACCT CACCCTCTCG TTACCCGTCG GCCTCTTGTT
          · Y  K  T    T  P  P  V    L  D  S    D  G  S    F  F  L  Y ·
1901      CTACAAGACC ACGCCTCCCG TGCTGGACTC CGACGGCTCC TTCTTCCTCT
          GATGTTCTGG TGCGGAGGGC ACGACCTGAG GCTGCCGAGG AAGAAGGAGA
          · S  R  L    T  V  D    K  S  R  W    Q  E  G    N  V  F
1951      ACAGCAGGCT AACCGTGGAC AAGAGCAGGT GGCAGGAGGG GAATGTCTTC
          TGTCGTCCGA TTGGCACCTG TTCTCGTCCA CCGTCCTCCC CTTACAGAAG
           S  C  S  V    M  H  E    A  L  H    N  H  Y  T    Q  K  S ·
2001      TCATGCTCCG TGATGCATGA GGCTCTGCAC AACCACTACA CACAGAAGAG
          AGTACGAGGC ACTACGTACT CCGAGACGTG TTGGTGATGT GTGTCTTCTC
                                      XbaI
                                      ~~~~~~~
          · L  S  L    S  L  G  K
2051      CCTCTCCCTG TCTCTGGGTA AATGATCTAG AGGGCCCTAT TCTATAGTGT
          GGAGAGGGAC AGAGACCCAT TTACTAGATC TCCCGGGATA AGATATCACA
2101      CACCTAAATG CTAGAGCTCG CTGATCAGCC TCGACTGTGC CTTCTAGTTG
          GTGGATTTAC GATCTCGAGC GACTAGTCGG AGCTGACACG GAAGATCAAC
2151      CCAGCCATCT GTTGTTTGCC CCTCCCCCGT GCCTTCCTTG ACCCTGGAAG
          GGTCGGTAGA CAACAAACGG GGAGGGGGCA CGGAAGGAAC TGGGACCTTC
2201      GTGCCACTCC CACTGTCCTT TCCTAATAAA ATGAGGAAAT TGCATCGCAT
          CACGGTGAGG GTGACAGGAA AGGATTATTT TACTCCTTTA ACGTAGCGTA
2251      TGTCTGAGTA GGTGTCATTC TATTCTGGGG GGTGGGGTGG GGCAGGACAG
          ACAGACTCAT CCACAGTAAG ATAAGACCCC CCACCCCACC CCGTCCTGTC
2301      CAAGGGGGAG GATTGGGAAG ACAATAGCAG GCATGCTGGG GATGCGGTGG
          GTTCCCCCTC CTAACCCTTC TGTTATCGTC CGTACGACCC CTACGCCACC
2351      GCTCTATGGC TTCTGAGGCG GAAAGAACCA GCTGGGGCTC TAGGGGGTAT
          CGAGATACCG AAGACTCCGC CTTTCTTGGT CGACCCCGAG ATCCCCCATA
2401      CCCCACGCGC CCTGTAGCGG CGCATTAAGC GCGGCGGGTG TGGTGGTTAC
          GGGGTGCGCG GGACATCGCC GCGTAATTCG CGCCGCCCAC ACCACCAATG
2451      GCGCAGCGTG ACCGCTACAC TTGCCAGCGC CCTAGCGCCC GCTCCTTTCG
          CGCGTCGCAC TGGCGATGTG AACGGTCGCG GGATCGCGGG CGAGGAAAGC
2501      CTTTCTTCCC TTCCTTTCTC GCCACGTTCG CCGGGCCTCT CAAAAAAGGG
          GAAAGAAGGG AAGGAAAGAG CGGTGCAAGC GGCCCGGAGA GTTTTTTCCC
2551      AAAAAAAGCA TGCATCTCAA TTAGTCAGCA ACCATAGTCC CGCCCCTAAC
          TTTTTTTCGT ACGTAGAGTT AATCAGTCGT TGGTATCAGG GCGGGGATTG
2601      TCCGCCCATC CCGCCCCTAA CTCCGCCCAG TTCCGCCCAT TCTCCGCCCC
          AGGCGGGTAG GGCGGGGATT GAGGCGGGTC AAGGCGGGTA AGAGGCGGGG
```

FIG. 2C

```
2651    ATGGCTGACT AATTTTTTTT ATTTATGCAG AGGCCGAGGC CGCCTCGGCC
        TACCGACTGA TTAAAAAAAA TAAATACGTC TCCGGCTCCG GCGGAGCCGG
2701    TCTGAGCTAT TCCAGAAGTA GTGAGGAGGC TTTTTTGGAG GCCTAGGCTT
        AGACTCGATA AGGTCTTCAT CACTCCTCCG AAAAAACCTC CGGATCCGAA
2751    TTGCAAAAAG CTTGGACAGC TCAGGGCTGC GATTTCGCGC CAAACTTGAC
        AACGTTTTTC GAACCTGTCG AGTCCCGACG CTAAAGCGCG GTTTGAACTG
2801    GGCAATCCTA GCGTGAAGGC TGGTAGGATT TTATCCCCGC TGCCATCATG
        CCGTTAGGAT CGCACTTCCG ACCATCCTAA AATAGGGGCG ACGGTAGTAC
2851    GTTCGACCAT TGAACTGCAT CGTCGCCGTG TCCCAAAATA TGGGGATTGG
        CAAGCTGGTA ACTTGACGTA GCAGCGGCAC AGGGTTTTAT ACCCCTAACC
2901    CAAGAACGGA GACCTACCCT GGCCTCCGCT CAGGAACGAG TTCAAGTACT
        GTTCTTGCCT CTGGATGGGA CCGGAGGCGA GTCCTTGCTC AAGTTCATGA
2951    TCCAAAGAAT GACCACAACC TCTTCAGTGG AAGGTAAACA GAATCTGGTG
        AGGTTTCTTA CTGGTGTTGG AGAAGTCACC TTCCATTTGT CTTAGACCAC
3001    ATTATGGGTA GGAAAACCTG GTTCTCCATT CCTGAGAAGA ATCGACCTTT
        TAATACCCAT CCTTTTGGAC CAAGAGGTAA GGACTCTTCT TAGCTGGAAA
3051    AAAGGACAGA ATTAATATAG TTCTCAGTAG AGAACTCAAA GAACCACCAC
        TTTCCTGTCT TAATTATATC AAGAGTCATC TCTTGAGTTT CTTGGTGGTG
3101    GAGGAGCTCA TTTTCTTGCC AAAAGTTTGG ATGATGCCTT AAGACTTATT
        CTCCTCGAGT AAAAGAACGG TTTTCAAACC TACTACGGAA TTCTGAATAA
3151    GAACAACCGG AATTGGCAAG TAAAGTAGAC ATGGTTTGGA TAGTCGGAGG
        CTTGTTGGCC TTAACCGTTC ATTTCATCTG TACCAAACCT ATCAGCCTCC
3201    CAGTTCTGTT TACCAGGAAG CCATGAATCA ACCAGGCCAC CTTAGACTCT
        GTCAAGACAA ATGGTCCTTC GGTACTTAGT TGGTCCGGTG GAATCTGAGA
3251    TTGTGACAAG GATCATGCAG GAATTTGAAA GTGACACGTT TTTCCCAGAA
        AACACTGTTC CTAGTACGTC CTTAAACTTT CACTGTGCAA AAAGGGTCTT
3301    ATTGATTTGG GGAAATATAA ACTTCTCCCA GAATACCCAG GCGTCCTCTC
        TAACTAAACC CCTTTATATT TGAAGAGGGT CTTATGGGTC CGCAGGAGAG
3351    TGAGGTCCAG GAGGAAAAAG GCATCAAGTA TAAGTTTGAA GTCTACGAGA
        ACTCCAGGTC CTCCTTTTTC CGTAGTTCAT ATTCAAACTT CAGATGCTCT
3401    AGAAAGACTA ACAGGAAGAT GCTTTCAAGT TCTCTGCTCC CCTCCTAAAG
        TCTTTCTGAT TGTCCTTCTA CGAAAGTTCA AGAGACGAGG GGAGGATTTC
3451    CTATGCATTT TTATAAGACC ATGGGACTTT TGCTGGCTTT AGATCTCTTT
        GATACGTAAA AATATTCTGG TACCCTGAAA ACGACCGAAA TCTAGAGAAA
3501    GTGAAGGAAC CTTACTTCTG TGGTGTGACA TAATTGGACA AACTACCTAC
        CACTTCCTTG GAATGAAGAC ACCACACTGT ATTAACCTGT TTGATGGATG
3551    AGAGATTTAA AGCTCTAAGG TAAATATAAA ATTTTTAAGT GTATAATGTG
        TCTCTAAATT TCGAGATTCC ATTTATATTT TAAAAATTCA CATATTACAC
3601    TTAAACTACT GATTCTAATT GTTTGTGTAT TTTAGATTCC AACCTATGGA
        AATTTGATGA CTAAGATTAA CAAACACATA AAATCTAAGG TTGGATACCT
3651    ACTGATGAAT GGGAGCAGTG GTGGAATGCC TTTAATGAGG AAAACCTGTT
        TGACTACTTA CCCTCGTCAC CACCTTACGG AAATTACTCC TTTTGGACAA
3701    TTGCTCAGAA GAAATGCCAT CTAGTGATGA TGAGGCTACT GCTGACTCTC
        AACGAGTCTT CTTTACGGTA GATCACTACT ACTCCGATGA CGACTGAGAG
3751    AACATTCTAC TCCTCCAAAA AAGAAGAGAA AGGTAGAAGA CCCCAAGGAC
        TTGTAAGATG AGGAGGTTTT TTCTTCTCTT TCCATCTTCT GGGGTTCCTG
3801    TTTCCTTCAG AATTGCTAAG TTTTTTGAGT CATGCTGTGT TTAGTAATAG
        AAAGGAAGTC TTAACGATTC AAAAAACTCA GTACGACACA AATCATTATC
3851    AACTCTTGCT TGCTTTGCTA TTTACACCAC AAAGGAAAAA GCTGCACTGC
        TTGAGAACGA ACGAAACGAT AAATGTGGTG TTTCCTTTTT CGACGTGACG
3901    TATACAAGAA AATTATGGAA AAATATTCTG TAACCTTTAT AAGTAGGCAT
        ATATGTTCTT TTAATACCTT TTTATAAGAC ATTGGAAATA TTCATCCGTA
3951    AACAGTTATA ATCATAACAT ACTGTTTTTT CTTACTCCAC ACAGGCATAG
        TTGTCAATAT TAGTATTGTA TGACAAAAAA GAATGAGGTG TGTCCGTATC
4001    AGTGTCTGCT ATTAATAACT ATGCTCAAAA ATTGTGTACC TTTAGCTTTT
        TCACAGACGA TAATTATTGA TACGAGTTTT TAACACATGG AAATCGAAAA
```

FIG. 2D

```
4051    TAATTTGTAA AGGGGTTAAT AAGGAATATT TGATGTATAG TGCCTTGACT
        ATTAAACATT TCCCCAATTA TTCCTTATAA ACTACATATC ACGGAACTGA
4101    AGAGATCATA ATCAGCCATA CCACATTTGT AGAGGTTTTA CTTGCTTTAA
        TCTCTAGTAT TAGTCGGTAT GGTGTAAACA TCTCCAAAAT GAACGAAATT
4151    AAAACCTCCC ACACCTCCCC CTGAACCTGA AACATAAAAT GAATGCAATT
        TTTTGGAGGG TGTGGAGGGG GACTTGGACT TTGTATTTTA CTTACGTTAA
4201    GTTGTTGTTA ACTTGTTTAT TGCAGCTTAT AATGGTTACA AATAAAGCAA
        CAACAACAAT TGAACAAATA ACGTCGAATA TTACCAATGT TTATTTCGTT
4251    TAGCATCACA AATTTCACAA ATAAAGCATT TTTTTCACTG CATTCTAGTT
        ATCGTAGTGT TTAAAGTGTT TATTTCGTAA AAAAAGTGAC GTAAGATCAA
4301    GTGGTTTGTC CAAACTCATC AATGTATCTT ATCATGTCTG GATCGGCTGG
        CACCAAACAG GTTTGAGTAG TTACATAGAA TAGTACAGAC CTAGCCGACC
4351    ATGATCCTCC AGCGCGGGGA TCTCATGCTG GAGTTCTTCG CCCACCCCAA
        TACTAGGAGG TCGCGCCCCT AGAGTACGAC CTCAAGAAGC GGGTGGGGTT
4401    CTTGTTTATT GCAGCTTATA ATGGTTACAA ATAAAGCAAT AGCATCACAA
        GAACAAATAA CGTCGAATAT TACCAATGTT TATTTCGTTA TCGTAGTGTT
4451    ATTTCACAAA TAAAGCATTT TTTTCACTGC ATTCTAGTTG TGGTTTGTCC
        TAAAGTGTTT ATTTCGTAAA AAAAGTGACG TAAGATCAAC ACCAAACAGG
4501    AAACTCATCA ATGTATCTTA TCATGTCTGT ATACCGTCGA CCTCTAGCTA
        TTTGAGTAGT TACATAGAAT AGTACAGACA TATGGCAGCT GGAGATCGAT
4551    GAGCTTGGCG TAATCATGGT CATAGCTGTT TCCTGTGTGA AATTGTTATC
        CTCGAACCGC ATTAGTACCA GTATCGACAA AGGACACACT TTAACAATAG
4601    CGCTCACAAT TCCACACAAC ATACGAGCCG GAAGCATAAA GTGTAAAGCC
        GCGAGTGTTA AGGTGTGTTG TATGCTCGGC CTTCGTATTT CACATTTCGG
4651    TGGGGTGCCT AATGAGTGAG CTAACTCACA TTAATTGCGT TGCGCTCACT
        ACCCCACGGA TTACTCACTC GATTGAGTGT AATTAACGCA ACGCGAGTGA
4701    GCCCGCTTTC CAGTCGGGAA ACCTGTCGTG CCAGCTGCAT TAATGAATCG
        CGGGCGAAAG GTCAGCCCTT TGGACAGCAC GGTCGACGTA ATTACTTAGC
4751    GCCAACGCGC GGGGAGAGGC GGTTTGCGTA TTGGGCGCTC TTCCGCTTCC
        CGGTTGCGCG CCCCTCTCCG CCAAACGCAT AACCCGCGAG AAGGCGAAGG
4801    TCGCTCACTG ACTCGCTGCG CTCGGTCGTT CGGCTGCGGC GAGCGGTATC
        AGCGAGTGAC TGAGCGACGC GAGCCAGCAA GCCGACGCCG CTCGCCATAG
4851    AGCTCACTCA AAGGCGGTAA TACGGTTATC CACAGAATCA GGGGATAACG
        TCGAGTGAGT TTCCGCCATT ATGCCAATAG GTGTCTTAGT CCCCTATTGC
4901    CAGGAAAGAA CATGTGAGCA AAAGGCCAGC AAAAGGCCAG GAACCGTAAA
        GTCCTTTCTT GTACACTCGT TTTCCGGTCG TTTTCCGGTC CTTGGCATTT
4951    AAGGCCGCGT TGCTGGCGTT TTTCCATAGG CTCCGCCCCC CTGACGAGCA
        TTCCGGCGCA ACGACCGCAA AAAGGTATCC GAGGCGGGGG GACTGCTCGT
5001    TCACAAAAAT CGACGCTCAA GTCAGAGGTG GCGAAACCCG ACAGGACTAT
        AGTGTTTTTA GCTGCGAGTT CAGTCTCCAC CGCTTTGGGC TGTCCTGATA
5051    AAAGATACCA GGCGTTTCCC CCTGGAAGCT CCCTCGTGCG CTCTCCTGTT
        TTTCTATGGT CCGCAAAGGG GGACCTTCGA GGGAGCACGC GAGAGGACAA
5101    CCGACCCTGC CGCTTACCGG ATACCTGTCC GCCTTTCTCC CTTCGGGAAG
        GGCTGGGACG GCGAATGGCC TATGGACAGG CGGAAAGAGG GAAGCCCTTC
5151    CGTGGCGCTT TCTCAATGCT CACGCTGTAG GTATCTCAGT TCGGTGTAGG
        GCACCGCGAA AGAGTTACGA GTGCGACATC CATAGAGTCA AGCCACATCC
5201    TCGTTCGCTC CAAGCTGGGC TGTGTGCACG AACCCCCCGT TCAGCCCGAC
        AGCAAGCGAG GTTCGACCCG ACACACGTGC TTGGGGGGCA AGTCGGGCTG
5251    CGCTGCGCCT TATCCGGTAA CTATCGTCTT GAGTCCAACC CGGTAAGACA
        GCGACGCGGA ATAGGCCATT GATAGCAGAA CTCAGGTTGG GCCATTCTGT
5301    CGACTTATCG CCACTGGCAG CAGCCACTGG TAACAGGATT AGCAGAGCGA
        GCTGAATAGC GGTGACCGTC GTCGGTGACC ATTGTCCTAA TCGTCTCGCT
5351    GGTATGTAGG CGGTGCTACA GAGTTCTTGA AGTGGTGGCC TAACTACGGC
        CCATACATCC GCCACGATGT CTCAAGAACT TCACCACCGG ATTGATGCCG
5401    TACACTAGAA GGACAGTATT TGGTATCTGC GCTCTGCTGA AGCCAGTTAC
        ATGTGATCTT CCTGTCATAA ACCATAGACG CGAGACGACT TCGGTCAATG
```

FIG. 2E

```
5451    CTTCGGAAAA AGAGTTGGTA GCTCTTGATC CGGCAAACAA ACCACCGCTG
        GAAGCCTTTT TCTCAACCAT CGAGAACTAG GCCGTTTGTT TGGTGGCGAC
5501    GTAGCGGTGG TTTTTTTGTT TGCAAGCAGC AGATTACGCG CAGAAAAAAA
        CATCGCCACC AAAAAAACAA ACGTTCGTCG TCTAATGCGC GTCTTTTTTT
5551    GGATCTCAAG AAGATCCTTT GATCTTTTCT ACGGGGTCTG ACGCTCAGTG
        CCTAGAGTTC TTCTAGGAAA CTAGAAAAGA TGCCCCAGAC TGCGAGTCAC
5601    GAACGAAAAC TCACGTTAAG GGATTTTGGT CATGAGATTA TCAAAAAGGA
        CTTGCTTTTG AGTGCAATTC CCTAAAACCA GTACTCTAAT AGTTTTTCCT
5651    TCTTCACCTA GATCCTTTTA AATTAAAAAT GAAGTTTTAA ATCAATCTAA
        AGAAGTGGAT CTAGGAAAAT TTAATTTTTA CTTCAAAATT TAGTTAGATT
5701    AGTATATATG AGTAAACTTG GTCTGACAGT TACCAATGCT TAATCAGTGA
        TCATATATAC TCATTTGAAC CAGACTGTCA ATGGTTACGA ATTAGTCACT
5751    GGCACCTATC TCAGCGATCT GTCTATTTCG TTCATCCATA GTTGCCTGAC
        CCGTGGATAG AGTCGCTAGA CAGATAAAGC AAGTAGGTAT CAACGGACTG
5801    TCCCCGTCGT GTAGATAACT ACGATACGGG AGGGCTTACC ATCTGGCCCC
        AGGGGCAGCA CATCTATTGA TGCTATGCCC TCCCGAATGG TAGACCGGGG
5851    AGTGCTGCAA TGATACCGCG AGACCCACGC TCACCGGCTC CAGATTTATC
        TCACGACGTT ACTATGGCGC TCTGGGTGCG AGTGGCCGAG GTCTAAATAG
5901    AGCAATAAAC CAGCCAGCCG GAAGGGCCGA GCGCAGAAGT GGTCCTGCAA
        TCGTTATTTG GTCGGTCGGC CTTCCCGGCT CGCGTCTTCA CCAGGACGTT
5951    CTTTATCCGC CTCCATCCAG TCTATTAATT GTTGCCGGGA AGCTAGAGTA
        GAAATAGGCG GAGGTAGGTC AGATAATTAA CAACGGCCCT TCGATCTCAT
6001    AGTAGTTCGC CAGTTAATAG TTTGCGCAAC GTTGTTGCCA TTGCTACAGG
        TCATCAAGCG GTCAATTATC AAACGCGTTG CAACAACGGT AACGATGTCC
6051    CATCGTGGTG TCACGCTCGT CGTTTGGTAT GGCTTCATTC AGCTCCGGTT
        GTAGCACCAC AGTGCGAGCA GCAAACCATA CCGAAGTAAG TCGAGGCCAA
6101    CCCAACGATC AAGGCGAGTT ACATGATCCC CCATGTTGTG CAAAAAAGCG
        GGGTTGCTAG TTCCGCTCAA TGTACTAGGG GGTACAACAC GTTTTTTCGC
6151    GTTAGCTCCT TCGGTCCTCC GATCGTTGTC AGAAGTAAGT TGGCCGCAGT
        CAATCGAGGA AGCCAGGAGG CTAGCAACAG TCTTCATTCA ACCGGCGTCA
6201    GTTATCACTC ATGGTTATGG CAGCACTGCA TAATTCTCTT ACTGTCATGC
        CAATAGTGAG TACCAATACC GTCGTGACGT ATTAAGAGAA TGACAGTACG
6251    CATCCGTAAG ATGCTTTTCT GTGACTGGTG AGTACTCAAC CAAGTCATTC
        GTAGGCATTC TACGAAAAGA CACTGACCAC TCATGAGTTG GTTCAGTAAG
6301    TGAGAATAGT GTATGCGGCG ACCGAGTTGC TCTTGCCCGG CGTCAATACG
        ACTCTTATCA CATACGCCGC TGGCTCAACG AGAACGGGCC GCAGTTATGC
6351    GGATAATACC GCGCCACATA GCAGAACTTT AAAAGTGCTC ATCATTGGAA
        CCTATTATGG CGCGGTGTAT CGTCTTGAAA TTTTCACGAG TAGTAACCTT
6401    AACGTTCTTC GGGGCGAAAA CTCTCAAGGA TCTTACCGCT GTTGAGATCC
        TTGCAAGAAG CCCCGCTTTT GAGAGTTCCT AGAATGGCGA CAACTCTAGG
6451    AGTTCGATGT AACCCACTCG TGCACCCAAC TGATCTTCAG CATCTTTTAC
        TCAAGCTACA TTGGGTGAGC ACGTGGGTTG ACTAGAAGTC GTAGAAAATG
6501    TTTCACCAGC GTTTCTGGGT GAGCAAAAAC AGGAAGGCAA AATGCCGCAA
        AAAGTGGTCG CAAAGACCCA CTCGTTTTTG TCCTTCCGTT TTACGGCGTT
6551    AAAAGGGAAT AAGGGCGACA CGGAAATGTT GAATACTCAT ACTCTTCCTT
        TTTTCCCTTA TTCCCGCTGT GCCTTTACAA CTTATGAGTA TGAGAAGGAA
6601    TTTCAATATT ATTGAAGCAT TTATCAGGGT TATTGTCTCA TGAGCGGATA
        AAAGTTATAA TAACTTCGTA AATAGTCCCA ATAACAGAGT ACTCGCCTAT
6651    CATATTTGAA TGTATTTAGA AAAATAAACA AATAGGGGTT CCGCGCACAT
        GTATAAACTT ACATAAATCT TTTTATTTGT TTATCCCCAA GGCGCGTGTA
6701    TTCCCCGAAA AGTGCCACCT GACGTCGACG GATCGGGAGA TCTGCTAGGT
        AAGGGGCTTT TCACGGTGGA CTGCAGCTGC CTAGCCCTCT AGACGATCCA
                  AscI
                ~~~~~~~~~~
6751    GACCTGAGGC GCGCCGGCTT CGAATAGCCA GAGTAACCTT TTTTTTAAT
        CTGGACTCCG CGCGGCCGAA GCTTATCGGT CTCATTGGAA AAAAAAATTA
```

FIG. 2F

```
6801    TTTATTTTAT TTTATTTTTG AGATGGAGTT TGGCGCCGAT CTCCCGATCC
        AAATAAAATA AAATAAAAAC TCTACCTCAA ACCGCGGCTA GAGGGCTAGG
6851    CCTATGGTCG ACTCTCAGTA CAATCTGCTC TGATGCCGCA TAGTTAAGCC
        GGATACCAGC TGAGAGTCAT GTTAGACGAG ACTACGGCGT ATCAATTCGG
6901    AGTATCTGCT CCCTGCTTGT GTGTTGGAGG TCGCTGAGTA GTGCGCGAGC
        TCATAGACGA GGGACGAACA CACAACCTCC AGCGACTCAT CACGCGCTCG
6951    AAAATTTAAG CTACAACAAG GCAAGGCTTG ACCGACAATT GCATGAAGAA
        TTTTAAATTC GATGTTGTTC CGTTCCGAAC TGGCTGTTAA CGTACTTCTT
7001    TCTGCTTAGG GTTAGGCGTT TTGCGCTGCT TCG
        AGACGAATCC CAATCCGCAA AACGCGACGA AGC
```

FIG. 2G

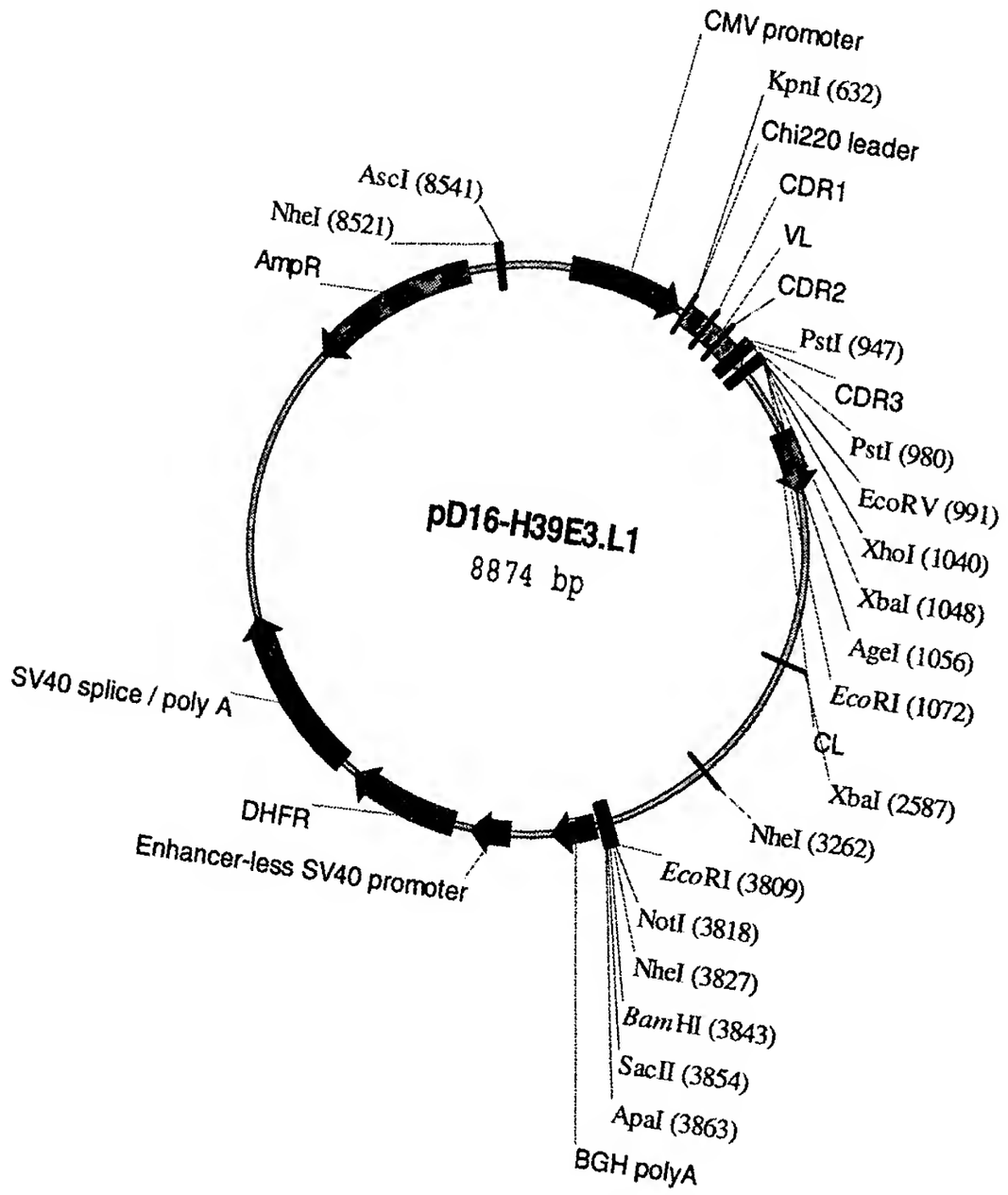
CMV promoter
KpnI (632)
Chi220 leader
CDR1
VL
CDR2
PstI (947)
CDR3
PstI (980)
EcoRV (991)
XhoI (1040)
XbaI (1048)
AgeI (1056)
EcoRI (1072)
CL
XbaI (2587)
NheI (3262)
EcoRI (3809)
NotI (3818)
NheI (3827)
BamHI (3843)
SacII (3854)
ApaI (3863)
BGH polyA
Enhancer-less SV40 promoter
DHFR
SV40 splice / poly A
AscI (8541)
NheI (8521)
AmpR
pD16-H39E3.L1
8874 bp

FIG. 3

```
  1   AATTACGGGG TCATTAGTTC ATAGCCCATA TATGGAGTTC CGCGTTACAT
      TTAATGCCCC AGTAATCAAG TATCGGGTAT ATACCTCAAG GCGCAATGTA
 51   AACTTACGGT AAATGGCCCG CCTGGCTGAC CGCCCAACGA CCCCCGCCCA
      TTGAATGCCA TTTACCGGGC GGACCGACTG GCGGGTTGCT GGGGGCGGGT
101   TTGACGTCAA TAATGACGTA TGTTCCCATA GTAACGCCAA TAGGGACTTT
      AACTGCAGTT ATTACTGCAT ACAAGGGTAT CATTGCGGTT ATCCCTGAAA
151   CCATTGACGT CAATGGGTGG ACTATTTACG GTAAACTGCC CACTTGGCAG
      GGTAACTGCA GTTACCCACC TGATAAATGC CATTTGACGG GTGAACCGTC
201   TACATCAAGT GTATCATATG CCAAGTACGC CCCCTATTGA CGTCAATGAC
      ATGTAGTTCA CATAGTATAC GGTTCATGCG GGGGATAACT GCAGTTACTG
251   GGTAAATGGC CCGCCTGGCA TTATGCCCAG TACATGACCT TATGGGACTT
      CCATTTACCG GGCGGACCGT AATACGGGTC ATGTACTGGA ATACCCTGAA
301   TCCTACTTGG CAGTACATCT ACGTATTAGT CATCGCTATT ACCATGGTGA
      AGGATGAACC GTCATGTAGA TGCATAATCA GTAGCGATAA TGGTACCACT
351   TGCGGTTTTG GCAGTACATC AATGGGCGTG GATAGCGGTT TGACTCACGG
      ACGCCAAAAC CGTCATGTAG TTACCCGCAC CTATCGCCAA ACTGAGTGCC
401   GGATTTCCAA GTCTCCACCC CATTGACGTC AATGGGAGTT TGTTTTGGCA
      CCTAAAGGTT CAGAGGTGGG GTAACTGCAG TTACCCTCAA ACAAAACCGT
451   CCAAAATCAA CGGGACTTTC CAAAATGTCG TAACAACTCC GCCCCATTGA
      GGTTTTAGTT GCCCTGAAAG GTTTTACAGC ATTGTTGAGG CGGGGTAACT
501   CGCAAATGGG CGGTAGGCGT GTACGGTGGG AGGTCTATAT AAGCAGAGCT
      GCGTTTACCC GCCATCCGCA CATGCCACCC TCCAGATATA TTCGTCTCGA
551   CTCTGGCTAA CTAGAGAACC CACTGCTTAC TGGCTTATCG AAATTAATAC
      GAGACCGATT GATCTCTTGG GTGACGAATG ACCGAATAGC TTTAATTATG
                                KpnI
                               ~~~~~~~
                                        M  E  A   P  A  Q
601   GACTCACTAT AGGGAGACCC AAGCTTGGTA CCATGGAAGC CCCAGCTCAG
      CTGAGTGATA TCCCTCTGGG TTCGAACCAT GGTACCTTCG GGGTCGAGTC
       L  L  F  L   L  L  L   W  L  P   D  T  T  G   D  I  V  ·
651   CTTCTCTTCC TCCTGCTACT CTGGCTCCCA GATACCACCG GAGACATTGT
      GAAGAGAAGG AGGACGATGA GACCGAGGGT CTATGGTGGC CTCTGTAACA
      ·  M  T  Q   S  P  D  S   L  A  V   S  L  G   E  R  A  T  ·
701   AATGACCCAG TCTCCAGACT CCCTGGCTGT GTCACTAGGA GAGCGGGCCA
      TTACTGGGTC AGAGGTCTGA GGGACCGACA CAGTGATCCT CTCGCCCGGT
                               CDR1
                  ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      ·  I  N  C   K  S  S   Q  S  L  L   S  S  G   N  Q  K
751   CTATAAACTG CAAGTCCAGT CAGAGTCTTT TATCCAGTGG AAACCAAAAG
      GATATTTGAC GTTCAGGTCA GTCTCAGAAA ATAGGTCACC TTTGGTTTTC
          CDR1
      ~~~~~~~~~~~~~
       N  Y  L  A   W  Y  Q   Q  K  P   G  Q  P  P   K  L  L  ·
801   AACTATTTGG CCTGGTATCA GCAGAAACCA GGCCAGCCTC CTAAACTACT
      TTGATAAACC GGACCATAGT CGTCTTTGGT CCGGTCGGAG GATTTGATGA
                        CDR2
            ~~~~~~~~~~~~~~~~~~~~~~~~~~
      ·  I  Y  Y   A  S  T  R   Q  S  G   V  P  D   R  F  S  G  ·
851   GATCTACTAT GCATCCACTA GGCAATCAGG GGTCCCTGAT CGCTTCAGTG
      CTAGATGATA CGTAGGTGAT CCGTTAGTCC CCAGGGACTA GCGAAGTCAC
                                                  PstI
                                                 ~~~~~~
      ·  S  G  S   G  T  D   F  T  L  T   I  S  S   L  Q  A
901   GCAGTGGATC TGGGACGGAC TTCACTCTGA CCATCAGCAG CCTGCAGGCT
      CGTCACCTAG ACCCTGCCTG AAGTGAGACT GGTAGTCGTC GGACGTCCGA
```

FIG. 4A

```
                                                    CDR3
                                                ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                                                 PstI          EcoRV
                                                ~~~~~~~       ~~~~~~~
          E  D  V  A   V  Y  Y   C  L  Q   Y  D  R  Y   P  F  T  ·
951       GAGGACGTGG CAGTCTATTA CTGCCTGCAG TATGACAGAT ATCCATTCAC
          CTCCTGCACC GTCAGATAAT GACGGACGTC ATACTGTCTA TAGGTAAGTG
          CDR3
          ~
                                                          XhoI     XbaI
                                                         ~~~~~~~  ~~~~
          · F  G  Q   G  T  K  L   E  I  K   R
1001      GTTCGGCCAA GGGACGAAGT TGGAAATAAA ACGTAAGTCT CGAGTCTCTA
          CAAGCCGGTT CCCTGCTTCA ACCTTTATTT TGCATTCAGA GCTCAGAGAT
               AgeI
              ~~~~~~~
          XbaI                    EcoRI
          ~~                      ~~~~~~
1051      GATAACCGGT CAATCGATTG GAATTCTAAA CTCTGAGGGG GTCGGATGAC
          CTATTGGCCA GTTAGCTAAC CTTAAGATTT GAGACTCCCC CAGCCTACTG
1101      GTGGCCATTC TTTGCCTAAA GCATTGAGTT TACTGCAAGG TCAGAAAAGC
          CACCGGTAAG AAACGGATTT CGTAACTCAA ATGACGTTCC AGTCTTTTCG
1151      ATGCAAAGCC CTCAGAATGG CTGCAAAGAG CTCCAACAAA ACAATTTAGA
          TACGTTTCGG GAGTCTTACC GACGTTTCTC GAGGTTGTTT TGTTAAATCT
1201      ACTTTATTAA GGAATAGGGG GAAGCTAGGA AGAAACTCAA AACATCAAGA
          TGAAATAATT CCTTATCCCC CTTCGATCCT TCTTTGAGTT TTGTAGTTCT
1251      TTTTAAATAC GCTTCTTGGT CTCCTTGCTA TAATTATCTG GGATAAGCAT
          AAAATTTATG CGAAGAACCA GAGGAACGAT ATTAATAGAC CCTATTCGTA
1301      GCTGTTTTCT GTCTGTCCCT AACATGCCCT GTGATTATCC GCAAACAACA
          CGACAAAAGA CAGACAGGGA TTGTACGGGA CACTAATAGG CGTTTGTTGT
1351      CACCCAAGGG CAGAACTTTG TTACTTAAAC ACCATCCTGT TTGCTTCTTT
          GTGGGTTCCC GTCTTGAAAC AATGAATTTG TGGTAGGACA AACGAAGAAA
                    T   V  A  A   P  S  V  F   I  F  P   P  S  D
1401      CCTCAGGAAC TGTGGCTGCA CCATCTGTCT TCATCTTCCC GCCATCTGAT
          GGAGTCCTTG ACACCGACGT GGTAGACAGA AGTAGAAGGG CGGTAGACTA
           E  Q  L  K   S  G  T   A  S  V   V  C  L  L   N  N  F  ·
1451      GAGCAGTTGA AATCTGGAAC TGCCTCTGTT GTGTGCCTGC TGAATAACTT
          CTCGTCAACT TTAGACCTTG ACGGAGACAA CACACGGACG ACTTATTGAA
          · Y  P  R   E  A  K  V   Q  W  K   V  D  N   A  L  Q  S  ·
1501      CTATCCCAGA GAGGCCAAAG TACAGTGGAA GGTGGATAAC GCCCTCCAAT
          GATAGGGTCT CTCCGGTTTC ATGTCACCTT CCACCTATTG CGGGAGGTTA
          · G  N  S   Q  E  S   V  T  E  Q   D  S  K   D  S  T
1551      CGGGTAACTC CCAGGAGAGT GTCACAGAGC AGGACAGCAA GGACAGCACC
          GCCCATTGAG GGTCCTCTCA CAGTGTCTCG TCCTGTCGTT CCTGTCGTGG
           Y  S  L  S   S  T  L   T  L  S   K  A  D  Y   E  K  H  ·
1601      TACAGCCTCA GCAGCACCCT GACGCTGAGC AAAGCAGACT ACGAGAAACA
          ATGTCGGAGT CGTCGTGGGA CTGCGACTCG TTTCGTCTGA TGCTCTTTGT
          · K  V  Y   A  C  E  V   T  H  Q   G  L  S   S  P  V  T  ·
1651      CAAAGTCTAC GCCTGCGAAG TCACCCATCA GGGCCTGAGC TCGCCCGTCA
          GTTTCAGATG CGGACGCTTC AGTGGGTAGT CCCGGACTCG AGCGGGCAGT
          · K  S  F   N  R  G   E  C
1701      CAAAGAGCTT CAACAGGGGA GAGTGTTAGA GGGAGAAGTG CCCCCACCTG
          GTTTCTCGAA GTTGTCCCCT CTCACAATCT CCCTCTTCAC GGGGGTGGAC
1751      CTCCTCAGTT CCAGCCTGAC CCCCTCCCAT CCTTTGGCCT CTGACCCTTT
          GAGGAGTCAA GGTCGGACTG GGGGAGGGTA GGAAACCGGA GACTGGGAAA
1801      TTCCACAGGG GACCTACCCC TATTGCGGTC CTCCAGCTCA TCTTTCACCT
          AAGGTGTCCC CTGGATGGGG ATAACGCCAG GAGGTCGAGT AGAAAGTGGA
```

FIG. 4B

```
1851    CACCCCCCTC CTCCTCCTTG GCTTTAATTA TGCTAATGTT GGAGGAGAAT
        GTGGGGGGAG GAGGAGGAAC CGAAATTAAT ACGATTACAA CCTCCTCTTA
1901    GAATAAATAA AGTGAATCTT TGCACCTGTG GTTTCTCTCT TTCCTCATTT
        CTTATTTATT TCACTTAGAA ACGTGGACAC CAAAGAGAGA AAGGAGTAAA
1951    AATAATTATT ATCTGTTGTT TTACCAACTA CTCAATTTCT CTTATAAGGG
        TTATTAATAA TAGACAACAA AATGGTTGAT GAGTTAAAGA GAATATTCCC
2001    ACTAAATATG TAGTCATCCT AAGGCGCATA ACCATTTATA AAAATCATCC
        TGATTTATAC ATCAGTAGGA TTCCGCGTAT TGGTAAATAT TTTTAGTAGG
2051    TTCATTCTAT TTTACCCTAT CATCCTCTGC AAGACAGTCC TCCCTCAAAC
        AAGTAAGATA AAATGGGATA GTAGGAGACG TTCTGTCAGG AGGGAGTTTG
2101    CCACAAGCCT TCTGTCCTCA CAGTCCCCTG GGCCATGGTA GGAGAGACTT
        GGTGTTCGGA AGACAGGAGT GTCAGGGGAC CCGGTACCAT CCTCTCTGAA
2151    GCTTCCTTGT TTTCCCCTCC TCAGCAAGCC CTCATAGTCC TTTTTAAGGG
        CGAAGGAACA AAAGGGGAGG AGTCGTTCGG GAGTATCAGG AAAAATTCCC
2201    TGACAGGTCT TACAGTCATA TATCCTTTGA TTCAATTCCC TGAGAATCAA
        ACTGTCCAGA ATGTCAGTAT ATAGGAAACT AAGTTAAGGG ACTCTTAGTT
2251    CCAAAGCAAA TTTTTCAAAA GAAGAAACCT GCTATAAAGA GAATCATTCA
        GGTTTCGTTT AAAAAGTTTT CTTCTTTGGA CGATATTTCT CTTAGTAAGT
2301    TTGCAACATG ATATAAAATA ACAACACAAT AAAAGCAATT AAATAAACAA
        AACGTTGTAC TATATTTTAT TGTTGTGTTA TTTTCGTTAA TTTATTTGTT
2351    ACAATAGGGA AATGTTTAAG TTCATCATGG TACTTAGACT TAATGGAATG
        TGTTATCCCT TTACAAATTC AAGTAGTACC ATGAATCTGA ATTACCTTAC
2401    TCATGCCTTA TTTACATTTT TAAACAGGTA CTGAGGGACT CCTGTCTGCC
        AGTACGGAAT AAATGTAAAA ATTTGTCCAT GACTCCCTGA GGACAGACGG
2451    AAGGGCCGTA TTGAGTACTT TCCACAACCT AATTTAATCC ACACTATACT
        TTCCCGGCAT AACTCATGAA AGGTGTTGGA TTAAATTAGG TGTGATATGA
2501    GTGAGATTAA AAACATTCAT TAAAATGTTG CAAAGGTTCT ATAAAGCTGA
        CACTCTAATT TTTGTAAGTA ATTTTACAAC GTTTCCAAGA TATTTCGACT
                                                  XbaI
                                                  ~~~~~~~
2551    GAGACAAATA TATTCTATAA CTCAGCAATC CCACTTCTAG ATGACTGAGT
        CTCTGTTTAT ATAAGATATT GAGTCGTTAG GGTGAAGATC TACTGACTCA
2601    GTCCCCACCC ACCAAAAAAC TATGCAAGAA TGTTCAAAGC AGCTTTATTT
        CAGGGGTGGG TGGTTTTTTG ATACGTTCTT ACAAGTTTCG TCGAAATAAA
2651    ACAAAAGCCA AAAATTGGAA ATAGCCCGAT TGTCCAACAA TAGAATGAGT
        TGTTTTCGGT TTTTAACCTT TATCGGGCTA ACAGGTTGTT ATCTTACTCA
2701    TATTAAACTG TGGTATGTTT ATACATTAGA ATACCCAATG AGGAGAATTA
        ATAATTTGAC ACCATACAAA TATGTAATCT TATGGGTTAC TCCTCTTAAT
2751    ACAAGCTACA ACTATACCTA CTCACACAGA TGAATCTCAT AAAAATAATG
        TGTTCGATGT TGATATGGAT GAGTGTGTCT ACTTAGAGTA TTTTTATTAC
2801    TTACATAAGA GAAACTCAAT GCAAAAGATA TGTTCTGTAT GTTTTCATCC
        AATGTATTCT CTTTGAGTTA CGTTTTCTAT ACAAGACATA CAAAAGTAGG
2851    ATATAAAGTT CAAAACCAGG TAAAAATAAA GTTAGAAATT TGGATGGAAA
        TATATTTCAA GTTTTGGTCC ATTTTTATTT CAATCTTTAA ACCTACCTTT
2901    TTACTCTTAG CTGGGGGTGG GCGAGTTAGT GCCTGGGAGA AGACAAGAAG
        AATGAGAATC GACCCCCACC CGCTCAATCA CGGACCCTCT TCTGTTCTTC
2951    GGGCTTCTGG GGTCTTGGTA ATGTTCTGTT CCTCGTGTGG GGTTGTGCAG
        CCCGAAGACC CCAGAACCAT TACAAGACAA GGAGCACACC CCAACACGTC
3001    TTATGATCTG TGCACTGTTC TGTATACACA TTATGCTTCA AAATAACTTC
        AATACTAGAC ACGTGACAAG ACATATGTGT AATACGAAGT TTTATTGAAG
3051    ACATAAAGAA CATCTTATAC CCAGTTAATA GATAGAAGAG GAATAAGTAA
        TGTATTTCTT GTAGAATATG GGTCAATTAT CTATCTTCTC CTTATTCATT
3101    TAGGTCAAGA CCACGCAGCT GGTAAGTGGG GGGGCCTGGG ATCAAATAGC
        ATCCAGTTCT GGTGCGTCGA CCATTCACCC CCCCGGACCC TAGTTTATCG
3151    TACCTGCCTA ATCCTGCCCT CTTGAGCCCT GAATGAGTCT GCCTTCCAGG
        ATGGACGGAT TAGGACGGGA GAACTCGGGA CTTACTCAGA CGGAAGGTCC
```

FIG. 4C

```
3201    GCTCAAGGTG CTCAACAAAA CAACAGGCCT GCTATTTTCC TGGCATCTGT
        CGAGTTCCAC GAGTTGTTTT GTTGTCCGGA CGATAAAAGG ACCGTAGACA
                    NheI
                    ~~~~~~
3251    GCCCTGTTTG GCTAGCTAGG AGCACACATA CATAGAAATT AAATGAAACA
        CGGGACAAAC CGATCGATCC TCGTGTGTAT GTATCTTTAA TTTACTTTGT
3301    GACCTTCAGC AAGGGGACAG AGGACAGAAT TAACCTTGCC CAGACACTGG
        CTGGAAGTCG TTCCCCTGTC TCCTGTCTTA ATTGGAACGG GTCTGTGACC
3351    AAACCCATGT ATGAACACTC ACATGTTTGG GAAGGGGGAA GGGCACATGT
        TTTGGGTACA TACTTGTGAG TGTACAAACC CTTCCCCCTT CCCGTGTACA
3401    AAATGAGGAC TCTTCCTCAT TCTATGGGGC ACTCTGGCCC TGCCCCTCTC
        TTTACTCCTG AGAAGGAGTA AGATACCCCG TGAGACCGGG ACGGGGAGAG
3451    AGCTACTCAT CCATCCAACA CACCTTTCTA AGTACCTCTC TCTGCCTACA
        TCGATGAGTA GGTAGGTTGT GTGGAAAGAT TCATGGAGAG AGACGGATGT
3501    CTCTGAAGGG GTTCAGGAGT AACTAACACA GCATCCCTTC CCTCAAATGA
        GAGACTTCCC CAAGTCCTCA TTGATTGTGT CGTAGGGAAG GGAGTTTACT
3551    CTGACAATCC CTTTGTCCTG CTTTGTTTTT CTTTCCAGTC AGTACTGGGA
        GACTGTTAGG GAAACAGGAC GAAACAAAAA GAAAGGTCAG TCATGACCCT
3601    AAGTGGGGAA GGACAGTCAT GGAGAAACTA CATAAGGAAG CACCTTGCCC
        TTCACCCCTT CCTGTCAGTA CCTCTTTGAT GTATTCCTTC GTGGAACGGG
3651    TTCTGCCTCT TGAGAATGTT GATGAGTATC AAATCTTTCA AACTTTGGAG
        AAGACGGAGA ACTCTTACAA CTACTCATAG TTTAGAAAGT TTGAAACCTC
3701    GTTTGAGTAG GGGTGAGACT CAGTAATGTC CCTTCCAATG ACATGAACTT
        CAAACTCATC CCCACTCTGA GTCATTACAG GGAAGGTTAC TGTACTTGAA
3751    GCTCACTCAT CCCTGGGGGC CAAATTGAAC AATCAAAGGC AGGCATAATC
        CGAGTGAGTA GGGACCCCCG GTTTAACTTG TTAGTTTCCG TCCGTATTAG
                                                        SacII
                                                        ~
              EcoRI       NotI       NheI                BamHI
              ~~~~~~~   ~~~~~~~~~   ~~~~~~~              ~~~~~~
3801    CAGTTATGAA TTCTTGCGGC CGCTTGCTAG CTTCACGTGT TGGATCCAAC
        GTCAATACTT AAGAACGCCG GCGAACGATC GAAGTGCACA ACCTAGGTTG
        SacII   ApaI
        ~~~~~   ~~~~~~~
3851    CGCGGAAGGG CCCTATTCTA TAGTGTCACC TAAATGCTAG AGCTCGCTGA
        GCGCCTTCCC GGGATAAGAT ATCACAGTGG ATTTACGATC TCGAGCGACT
3901    TCAGCCTCGA CTGTGCCTTC TAGTTGCCAG CCATCTGTTG TTTGCCCCTC
        AGTCGGAGCT GACACGGAAG ATCAACGGTC GGTAGACAAC AAACGGGGAG
3951    CCCCGTGCCT TCCTTGACCC TGGAAGGTGC CACTCCCACT GTCCTTTCCT
        GGGGCACGGA AGGAACTGGG ACCTTCCACG GTGAGGGTGA CAGGAAAGGA
4001    AATAAAATGA GGAAATTGCA TCGCATTGTC TGAGTAGGTG TCATTCTATT
        TTATTTTACT CCTTTAACGT AGCGTAACAG ACTCATCCAC AGTAAGATAA
4051    CTGGGGGGTG GGGTGGGGCA GGACAGCAAG GGGGAGGATT GGGAAGACAA
        GACCCCCCAC CCCACCCCGT CCTGTCGTTC CCCCTCCTAA CCCTTCTGTT
4101    TAGCAGGCAT GCTGGGGATG CGGTGGGCTC TATGGCTTCT GAGGCGGAAA
        ATCGTCCGTA CGACCCCTAC GCCACCCGAG ATACCGAAGA CTCCGCCTTT
4151    GAACCAGCTG GGGCTCTAGG GGGTATCCCC ACGCGCCCTG TAGCGGCGCA
        CTTGGTCGAC CCCGAGATCC CCCATAGGGG TGCGCGGGAC ATCGCCGCGT
4201    TTAAGCGCGG CGGGTGTGGT GGTTACGCGC AGCGTGACCG CTACACTTGC
        AATTCGCGCC GCCCACACCA CCAATGCGCG TCGCACTGGC GATGTGAACG
4251    CAGCGCCCTA GCGCCCGCTC CTTTCGCTTT CTTCCCTTCC TTTCTCGCCA
        GTCGCGGGAT CGCGGGCGAG GAAAGCGAAA GAAGGGAAGG AAAGAGCGGT
4301    CGTTCGCCGG GCCTCTCAAA AAAGGGAAAA AAAGCATGCA TCTCAATTAG
        GCAAGCGGCC CGGAGAGTTT TTTCCCTTTT TTTCGTACGT AGAGTTAATC
4351    TCAGCAACCA TAGTCCCGCC CCTAACTCCG CCCATCCCGC CCCTAACTCC
        AGTCGTTGGT ATCAGGGCGG GGATTGAGGC GGGTAGGGCG GGGATTGAGG
```

FIG. 4D

```
4401    GCCCAGTTCC GCCCATTCTC CGCCCCATGG CTGACTAATT TTTTTTATTT
        CGGGTCAAGG CGGGTAAGAG GCGGGGTACC GACTGATTAA AAAAAATAAA
4451    ATGCAGAGGC CGAGGCCGCC TCGGCCTCTG AGCTATTCCA GAAGTAGTGA
        TACGTCTCCG GCTCCGGCGG AGCCGGAGAC TCGATAAGGT CTTCATCACT
4501    GGAGGCTTTT TTGGAGGCCT AGGCTTTTGC AAAAAGCTTG GACAGCTCAG
        CCTCCGAAAA AACCTCCGGA TCCGAAAACG TTTTTCGAAC CTGTCGAGTC
4551    GGCTGCGATT TCGCGCCAAA CTTGACGGCA ATCCTAGCGT GAAGGCTGGT
        CCGACGCTAA AGCGCGGTTT GAACTGCCGT TAGGATCGCA CTTCCGACCA
4601    AGGATTTTAT CCCCGCTGCC ATCATGGTTC GACCATTGAA CTGCATCGTC
        TCCTAAAATA GGGGCGACGG TAGTACCAAG CTGGTAACTT GACGTAGCAG
4651    GCCGTGTCCC AAAATATGGG GATTGGCAAG AACGGAGACC TACCCTGGCC
        CGGCACAGGG TTTTATACCC CTAACCGTTC TTGCCTCTGG ATGGGACCGG
4701    TCCGCTCAGG AACGAGTTCA AGTACTTCCA AAGAATGACC ACAACCTCTT
        AGGCGAGTCC TTGCTCAAGT TCATGAAGGT TTCTTACTGG TGTTGGAGAA
4751    CAGTGGAAGG TAAACAGAAT CTGGTGATTA TGGGTAGGAA AACCTGGTTC
        GTCACCTTCC ATTTGTCTTA GACCACTAAT ACCCATCCTT TTGGACCAAG
4801    TCCATTCCTG AGAAGAATCG ACCTTTAAAG GACAGAATTA ATATAGTTCT
        AGGTAAGGAC TCTTCTTAGC TGGAAATTTC CTGTCTTAAT TATATCAAGA
4851    CAGTAGAGAA CTCAAAGAAC CACCACGAGG AGCTCATTTT CTTGCCAAAA
        GTCATCTCTT GAGTTTCTTG GTGGTGCTCC TCGAGTAAAA GAACGGTTTT
4901    GTTTGGATGA TGCCTTAAGA CTTATTGAAC AACCGGAATT GGCAAGTAAA
        CAAACCTACT ACGGAATTCT GAATAACTTG TTGGCCTTAA CCGTTCATTT
4951    GTAGACATGG TTTGGATAGT CGGAGGCAGT TCTGTTTACC AGGAAGCCAT
        CATCTGTACC AAACCTATCA GCCTCCGTCA AGACAAATGG TCCTTCGGTA
5001    GAATCAACCA GGCCACCTTA GACTCTTTGT GACAAGGATC ATGCAGGAAT
        CTTAGTTGGT CCGGTGGAAT CTGAGAAACA CTGTTCCTAG TACGTCCTTA
5051    TTGAAAGTGA CACGTTTTTC CCAGAAATTG ATTTGGGGAA ATATAAACTT
        AACTTTCACT GTGCAAAAAG GGTCTTTAAC TAAACCCCTT TATATTTGAA
5101    CTCCCAGAAT ACCCAGGCGT CCTCTCTGAG GTCCAGGAGG AAAAAGGCAT
        GAGGGTCTTA TGGGTCCGCA GGAGAGACTC CAGGTCCTCC TTTTTCCGTA
5151    CAAGTATAAG TTTGAAGTCT ACGAGAAGAA AGACTAACAG GAAGATGCTT
        GTTCATATTC AAACTTCAGA TGCTCTTCTT TCTGATTGTC CTTCTACGAA
5201    TCAAGTTCTC TGCTCCCCTC CTAAAGCTAT GCATTTTTAT AAGACCATGG
        AGTTCAAGAG ACGAGGGGAG GATTTCGATA CGTAAAAATA TTCTGGTACC
5251    GACTTTTGCT GGCTTTAGAT CTCTTTGTGA AGGAACCTTA CTTCTGTGGT
        CTGAAAACGA CCGAAATCTA GAGAAACACT TCCTTGGAAT GAAGACACCA
5301    GTGACATAAT TGGACAAACT ACCTACAGAG ATTTAAAGCT CTAAGGTAAA
        CACTGTATTA ACCTGTTTGA TGGATGTCTC TAAATTTCGA GATTCCATTT
5351    TATAAAATTT TTAAGTGTAT AATGTGTTAA ACTACTGATT CTAATTGTTT
        ATATTTTAAA AATTCACATA TTACACAATT TGATGACTAA GATTAACAAA
5401    GTGTATTTTA GATTCCAACC TATGGAACTG ATGAATGGGA GCAGTGGTGG
        CACATAAAAT CTAAGGTTGG ATACCTTGAC TACTTACCCT CGTCACCACC
5451    AATGCCTTTA ATGAGGAAAA CCTGTTTTGC TCAGAAGAAA TGCCATCTAG
        TTACGGAAAT TACTCCTTTT GGACAAAACG AGTCTTCTTT ACGGTAGATC
5501    TGATGATGAG GCTACTGCTG ACTCTCAACA TTCTACTCCT CCAAAAAAGA
        ACTACTACTC CGATGACGAC TGAGAGTTGT AAGATGAGGA GGTTTTTTCT
5551    AGAGAAAGGT AGAAGACCCC AAGGACTTTC CTTCAGAATT GCTAAGTTTT
        TCTCTTTCCA TCTTCTGGGG TTCCTGAAAG GAAGTCTTAA CGATTCAAAA
5601    TTGAGTCATG CTGTGTTTAG TAATAGAACT CTTGCTTGCT TTGCTATTTA
        AACTCAGTAC GACACAAATC ATTATCTTGA GAACGAACGA AACGATAAAT
5651    CACCACAAAG GAAAAAGCTG CACTGCTATA CAAGAAAATT ATGGAAAAAT
        GTGGTGTTTC CTTTTTCGAC GTGACGATAT GTTCTTTTAA TACCTTTTTA
5701    ATTCTGTAAC CTTTATAAGT AGGCATAACA GTTATAATCA TAACATACTG
        TAAGACATTG GAAATATTCA TCCGTATTGT CAATATTAGT ATTGTATGAC
5751    TTTTTTCTTA CTCCACACAG GCATAGAGTG TCTGCTATTA ATAACTATGC
        AAAAAAGAAT GAGGTGTGTC CGTATCTCAC AGACGATAAT TATTGATACG
```

FIG. 4E

```
5801    TCAAAAATTG TGTACCTTTA GCTTTTTAAT TTGTAAAGGG GTTAATAAGG
        AGTTTTTAAC ACATGGAAAT CGAAAAATTA AACATTTCCC CAATTATTCC
5851    AATATTTGAT GTATAGTGCC TTGACTAGAG ATCATAATCA GCCATACCAC
        TTATAAACTA CATATCACGG AACTGATCTC TAGTATTAGT CGGTATGGTG
5901    ATTTGTAGAG GTTTTACTTG CTTTAAAAAA CCTCCCACAC CTCCCCCTGA
        TAAACATCTC CAAAATGAAC GAAATTTTTT GGAGGGTGTG GAGGGGGACT
5951    ACCTGAAACA TAAAATGAAT GCAATTGTTG TTGTTAACTT GTTTATTGCA
        TGGACTTTGT ATTTTACTTA CGTTAACAAC AACAATTGAA CAAATAACGT
6001    GCTTATAATG GTTACAAATA AAGCAATAGC ATCACAAATT TCACAAATAA
        CGAATATTAC CAATGTTTAT TTCGTTATCG TAGTGTTTAA AGTGTTTATT
6051    AGCATTTTTT TCACTGCATT CTAGTTGTGG TTTGTCCAAA CTCATCAATG
        TCGTAAAAAA AGTGACGTAA GATCAACACC AAACAGGTTT GAGTAGTTAC
6101    TATCTTATCA TGTCTGGATC GGCTGGATGA TCCTCCAGCG CGGGGATCTC
        ATAGAATAGT ACAGACCTAG CCGACCTACT AGGAGGTCGC GCCCCTAGAG
6151    ATGCTGGAGT TCTTCGCCCA CCCCAACTTG TTTATTGCAG CTTATAATGG
        TACGACCTCA AGAAGCGGGT GGGGTTGAAC AAATAACGTC GAATATTACC
6201    TTACAAATAA AGCAATAGCA TCACAAATTT CACAAATAAA GCATTTTTTT
        AATGTTTATT TCGTTATCGT AGTGTTTAAA GTGTTTATTT CGTAAAAAAA
6251    CACTGCATTC TAGTTGTGGT TTGTCCAAAC TCATCAATGT ATCTTATCAT
        GTGACGTAAG ATCAACACCA AACAGGTTTG AGTAGTTACA TAGAATAGTA
6301    GTCTGTATAC CGTCGACCTC TAGCTAGAGC TTGGCGTAAT CATGGTCATA
        CAGACATATG GCAGCTGGAG ATCGATCTCG AACCGCATTA GTACCAGTAT
6351    GCTGTTTCCT GTGTGAAATT GTTATCCGCT CACAATTCCA CACAACATAC
        CGACAAAGGA CACACTTTAA CAATAGGCGA GTGTTAAGGT GTGTTGTATG
6401    GAGCCGGAAG CATAAAGTGT AAAGCCTGGG GTGCCTAATG AGTGAGCTAA
        CTCGGCCTTC GTATTTCACA TTTCGGACCC CACGGATTAC TCACTCGATT
6451    CTCACATTAA TTGCGTTGCG CTCACTGCCC GCTTTCCAGT CGGGAAACCT
        GAGTGTAATT AACGCAACGC GAGTGACGGG CGAAAGGTCA GCCCTTTGGA
6501    GTCGTGCCAG CTGCATTAAT GAATCGGCCA ACGCGCGGGG AGAGGCGGTT
        CAGCACGGTC GACGTAATTA CTTAGCCGGT TGCGCGCCCC TCTCCGCCAA
6551    TGCGTATTGG GCGCTCTTCC GCTTCCTCGC TCACTGACTC GCTGCGCTCG
        ACGCATAACC CGCGAGAAGG CGAAGGAGCG AGTGACTGAG CGACGCGAGC
6601    GTCGTTCGGC TGCGGCGAGC GGTATCAGCT CACTCAAAGG CGGTAATACG
        CAGCAAGCCG ACGCCGCTCG CCATAGTCGA GTGAGTTTCC GCCATTATGC
6651    GTTATCCACA GAATCAGGGG ATAACGCAGG AAAGAACATG TGAGCAAAAG
        CAATAGGTGT CTTAGTCCCC TATTGCGTCC TTTCTTGTAC ACTCGTTTTC
6701    GCCAGCAAAA GGCCAGGAAC CGTAAAAAGG CCGCGTTGCT GGCGTTTTTC
        CGGTCGTTTT CCGGTCCTTG GCATTTTTCC GGCGCAACGA CCGCAAAAAG
6751    CATAGGCTCC GCCCCCCTGA CGAGCATCAC AAAAATCGAC GCTCAAGTCA
        GTATCCGAGG CGGGGGGACT GCTCGTAGTG TTTTTAGCTG CGAGTTCAGT
6801    GAGGTGGCGA AACCCGACAG GACTATAAAG ATACCAGGCG TTTCCCCCTG
        CTCCACCGCT TTGGGCTGTC CTGATATTTC TATGGTCCGC AAAGGGGGAC
6851    GAAGCTCCCT CGTGCGCTCT CCTGTTCCGA CCCTGCCGCT TACCGGATAC
        CTTCGAGGGA GCACGCGAGA GGACAAGGCT GGGACGGCGA ATGGCCTATG
6901    CTGTCCGCCT TTCTCCCTTC GGGAAGCGTG GCGCTTTCTC AATGCTCACG
        GACAGGCGGA AAGAGGGAAG CCCTTCGCAC CGCGAAAGAG TTACGAGTGC
6951    CTGTAGGTAT CTCAGTTCGG TGTAGGTCGT TCGCTCCAAG CTGGGCTGTG
        GACATCCATA GAGTCAAGCC ACATCCAGCA AGCGAGGTTC GACCCGACAC
7001    TGCACGAACC CCCCGTTCAG CCCGACCGCT GCGCCTTATC CGGTAACTAT
        ACGTGCTTGG GGGGCAAGTC GGGCTGGCGA CGCGGAATAG GCCATTGATA
7051    CGTCTTGAGT CCAACCCGGT AAGACACGAC TTATCGCCAC TGGCAGCAGC
        GCAGAACTCA GGTTGGGCCA TTCTGTGCTG AATAGCGGTG ACCGTCGTCG
7101    CACTGGTAAC AGGATTAGCA GAGCGAGGTA TGTAGGCGGT GCTACAGAGT
        GTGACCATTG TCCTAATCGT CTCGCTCCAT ACATCCGCCA CGATGTCTCA
7151    TCTTGAAGTG GTGGCCTAAC TACGGCTACA CTAGAAGGAC AGTATTTGGT
        AGAACTTCAC CACCGGATTG ATGCCGATGT GATCTTCCTG TCATAAACCA
```

FIG. 4F

```
7201    ATCTGCGCTC TGCTGAAGCC AGTTACCTTC GGAAAAAGAG TTGGTAGCTC
        TAGACGCGAG ACGACTTCGG TCAATGGAAG CCTTTTTCTC AACCATCGAG
7251    TTGATCCGGC AAACAAACCA CCGCTGGTAG CGGTGGTTTT TTTGTTTGCA
        AACTAGGCCG TTTGTTTGGT GGCGACCATC GCCACCAAAA AAACAAACGT
7301    AGCAGCAGAT TACGCGCAGA AAAAAAGGAT CTCAAGAAGA TCCTTTGATC
        TCGTCGTCTA ATGCGCGTCT TTTTTTCCTA GAGTTCTTCT AGGAAACTAG
7351    TTTTCTACGG GGTCTGACGC TCAGTGGAAC GAAAACTCAC GTTAAGGGAT
        AAAAGATGCC CCAGACTGCG AGTCACCTTG CTTTTGAGTG CAATTCCCTA
7401    TTTGGTCATG AGATTATCAA AAAGGATCTT CACCTAGATC CTTTTAAATT
        AAACCAGTAC TCTAATAGTT TTTCCTAGAA GTGGATCTAG GAAAATTTAA
7451    AAAAATGAAG TTTTAAATCA ATCTAAAGTA TATATGAGTA AACTTGGTCT
        TTTTTACTTC AAAATTTAGT TAGATTTCAT ATATACTCAT TTGAACCAGA
7501    GACAGTTACC AATGCTTAAT CAGTGAGGCA CCTATCTCAG CGATCTGTCT
        CTGTCAATGG TTACGAATTA GTCACTCCGT GGATAGAGTC GCTAGACAGA
7551    ATTTCGTTCA TCCATAGTTG CCTGACTCCC CGTCGTGTAG ATAACTACGA
        TAAAGCAAGT AGGTATCAAC GGACTGAGGG GCAGCACATC TATTGATGCT
7601    TACGGGAGGG CTTACCATCT GGCCCCAGTG CTGCAATGAT ACCGCGAGAC
        ATGCCCTCCC GAATGGTAGA CCGGGGTCAC GACGTTACTA TGGCGCTCTG
7651    CCACGCTCAC CGGCTCCAGA TTTATCAGCA ATAAACCAGC CAGCCGGAAG
        GGTGCGAGTG GCCGAGGTCT AAATAGTCGT TATTTGGTCG GTCGGCCTTC
7701    GGCCGAGCGC AGAAGTGGTC CTGCAACTTT ATCCGCCTCC ATCCAGTCTA
        CCGGCTCGCG TCTTCACCAG GACGTTGAAA TAGGCGGAGG TAGGTCAGAT
7751    TTAATTGTTG CCGGGAAGCT AGAGTAAGTA GTTCGCCAGT TAATAGTTTG
        AATTAACAAC GGCCCTTCGA TCTCATTCAT CAAGCGGTCA ATTATCAAAC
7801    CGCAACGTTG TTGCCATTGC TACAGGCATC GTGGTGTCAC GCTCGTCGTT
        GCGTTGCAAC AACGGTAACG ATGTCCGTAG CACCACAGTG CGAGCAGCAA
7851    TGGTATGGCT TCATTCAGCT CCGGTTCCCA ACGATCAAGG CGAGTTACAT
        ACCATACCGA AGTAAGTCGA GGCCAAGGGT TGCTAGTTCC GCTCAATGTA
7901    GATCCCCCAT GTTGTGCAAA AAAGCGGTTA GCTCCTTCGG TCCTCCGATC
        CTAGGGGGTA CAACACGTTT TTTCGCCAAT CGAGGAAGCC AGGAGGCTAG
7951    GTTGTCAGAA GTAAGTTGGC CGCAGTGTTA TCACTCATGG TTATGGCAGC
        CAACAGTCTT CATTCAACCG GCGTCACAAT AGTGAGTACC AATACCGTCG
8001    ACTGCATAAT TCTCTTACTG TCATGCCATC CGTAAGATGC TTTTCTGTGA
        TGACGTATTA AGAGAATGAC AGTACGGTAG GCATTCTACG AAAAGACACT
8051    CTGGTGAGTA CTCAACCAAG TCATTCTGAG AATAGTGTAT GCGGCGACCG
        GACCACTCAT GAGTTGGTTC AGTAAGACTC TTATCACATA CGCCGCTGGC
8101    AGTTGCTCTT GCCCGGCGTC AATACGGGAT AATACCGCGC CACATAGCAG
        TCAACGAGAA CGGGCCGCAG TTATGCCCTA TTATGGCGCG GTGTATCGTC
8151    AACTTTAAAA GTGCTCATCA TTGGAAAACG TTCTTCGGGG CGAAAACTCT
        TTGAAATTTT CACGAGTAGT AACCTTTTGC AAGAAGCCCC GCTTTTGAGA
8201    CAAGGATCTT ACCGCTGTTG AGATCCAGTT CGATGTAACC CACTCGTGCA
        GTTCCTAGAA TGGCGACAAC TCTAGGTCAA GCTACATTGG GTGAGCACGT
8251    CCCAACTGAT CTTCAGCATC TTTTACTTTC ACCAGCGTTT CTGGGTGAGC
        GGGTTGACTA GAAGTCGTAG AAAATGAAAG TGGTCGCAAA GACCCACTCG
8301    AAAAACAGGA AGGCAAAATG CCGCAAAAAA GGGAATAAGG GCGACACGGA
        TTTTTGTCCT TCCGTTTTAC GGCGTTTTTT CCCTTATTCC CGCTGTGCCT
8351    AATGTTGAAT ACTCATACTC TTCCTTTTTC AATATTATTG AAGCATTTAT
        TTACAACTTA TGAGTATGAG AAGGAAAAAG TTATAATAAC TTCGTAAATA
8401    CAGGGTTATT GTCTCATGAG CGGATACATA TTTGAATGTA TTTAGAAAAA
        GTCCCAATAA CAGAGTACTC GCCTATGTAT AAACTTACAT AAATCTTTTT
8451    TAAACAAATA GGGGTTCCGC GCACATTTCC CCGAAAAGTG CCACCTGACG
        ATTTGTTTAT CCCCAAGGCG CGTGTAAAGG GGCTTTTCAC GGTGGACTGC
                              NheI                AscI
                             ~~~~~~~             ~~~~~~~~~~
8501    TCGACGGATC GGGAGATCTG CTAGCCCGGG TGACCTGAGG CGCGCCGGCT
        AGCTGCCTAG CCCTCTAGAC GATCGGGCCC ACTGGACTCC GCGCGGCCGA
```

FIG. 4G

```
8551    TCGAATAGCC AGAGTAACCT TTTTTTTTAA TTTTATTTTA TTTTATTTTT
        AGCTTATCGG TCTCATTGGA AAAAAAAATT AAAATAAAAT AAAATAAAAA
8601    GAGATGGAGT TTGGCGCCGA TCTCCCGATC CCCTATGGTC GACTCTCAGT
        CTCTACCTCA AACCGCGGCT AGAGGGCTAG GGGATACCAG CTGAGAGTCA
8651    ACAATCTGCT CTGATGCCGC ATAGTTAAGC CAGTATCTGC TCCCTGCTTG
        TGTTAGACGA GACTACGGCG TATCAATTCG GTCATAGACG AGGGACGAAC
8701    TGTGTTGGAG GTCGCTGAGT AGTGCGCGAG CAAAATTTAA GCTACAACAA
        ACACAACCTC CAGCGACTCA TCACGCGCTC GTTTTAAATT CGATGTTGTT
8751    GGCAAGGCTT GACCGACAAT TGCATGAAGA ATCTGCTTAG GGTTAGGCGT
        CCGTTCCGAA CTGGCTGTTA ACGTACTTCT TAGACGAATC CCAATCCGCA
8801    TTTGCGCTGC TTCGCGATGT ACGGGCCAGA TATACGCGTT GACATTGATT
        AAACGCGACG AAGCGCTACA TGCCCGGTCT ATATGCGCAA CTGTAACTAA
8851    ATTGACTAGT TATTAATAGT AATC
        TAACTGATCA ATAATTATCA TTAG
```

FIG. 4H

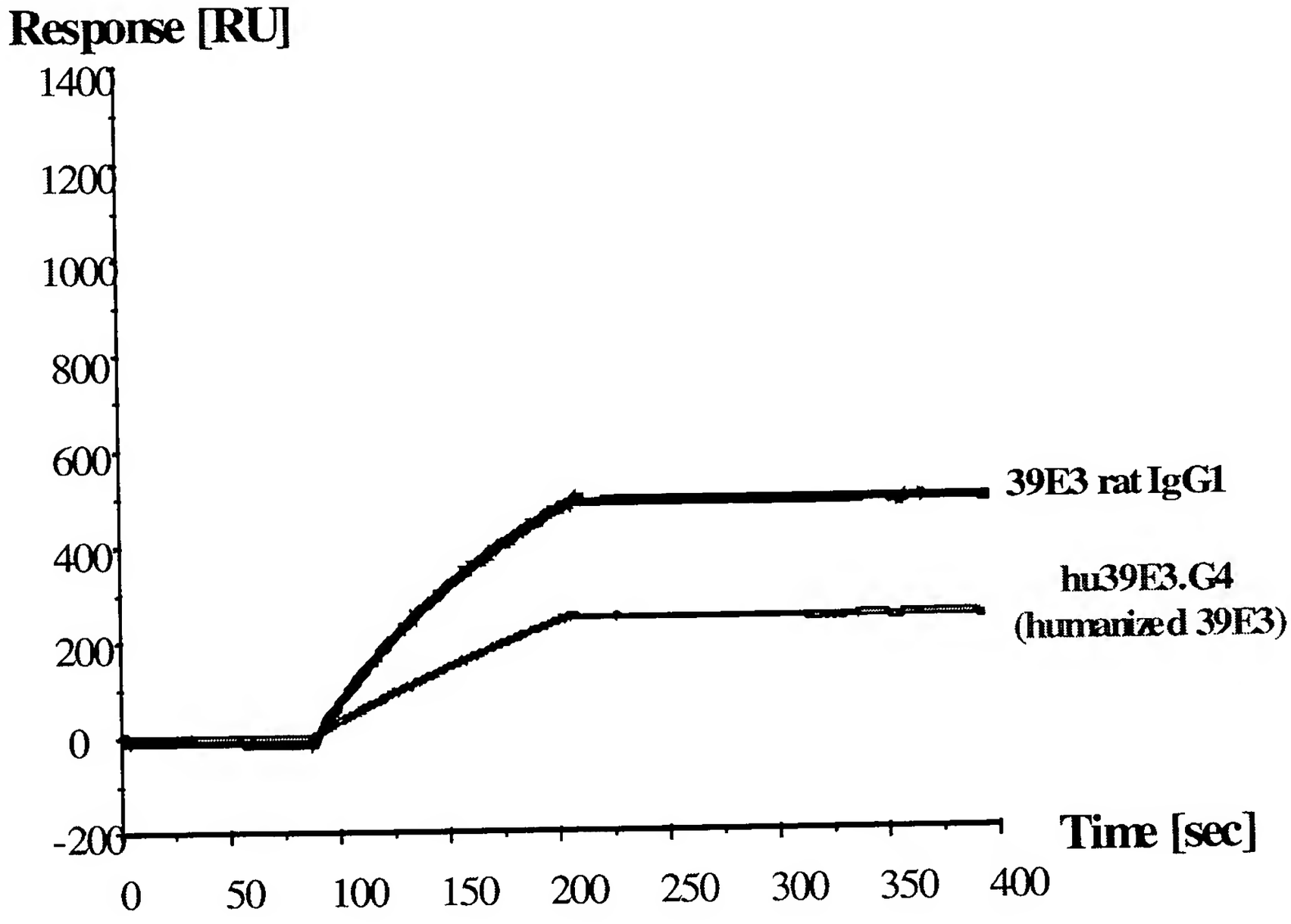
Response [RU]
1400
1200
1000
800
600
400
200
0
-200
0
50
100
150
200
250
300
350
400
Time [sec]
39E3 rat IgG1
hu39E3.G4
(humanized 39E3)

FIG. 5

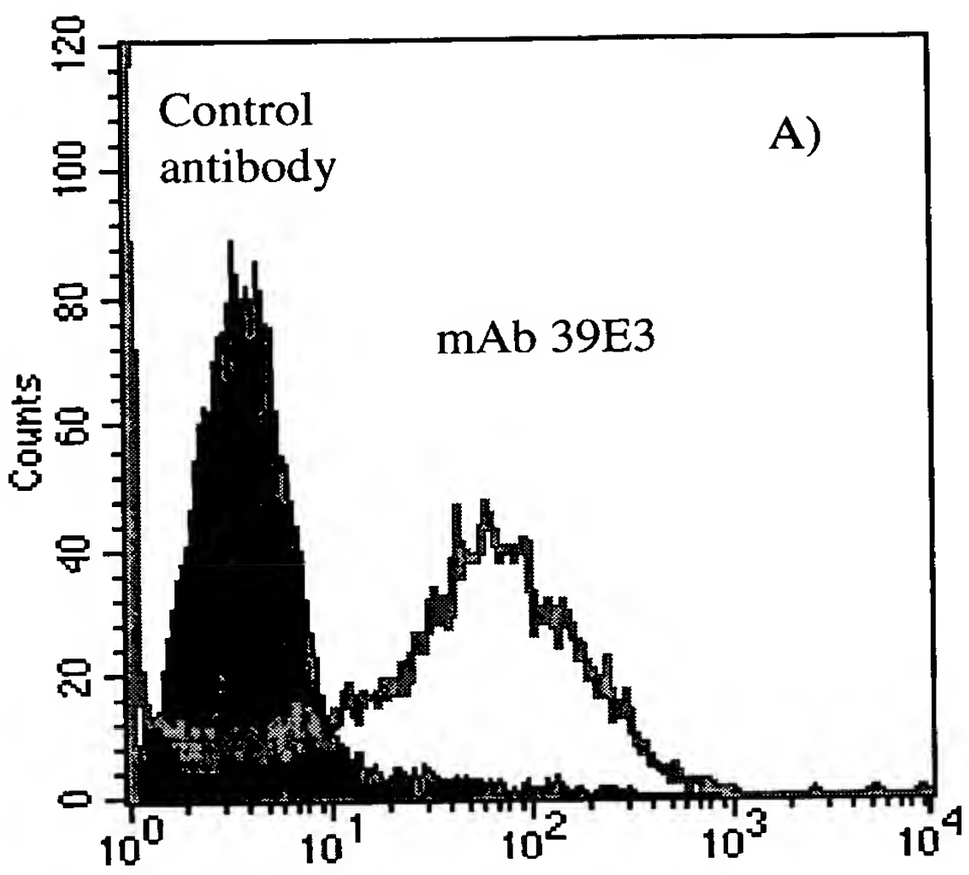
Control
antibody
A)
mAb 39E3
Counts
0
20
40
60
80
100
120
10^0
10^1
10^2
10^3
10^4

FIG. 6A

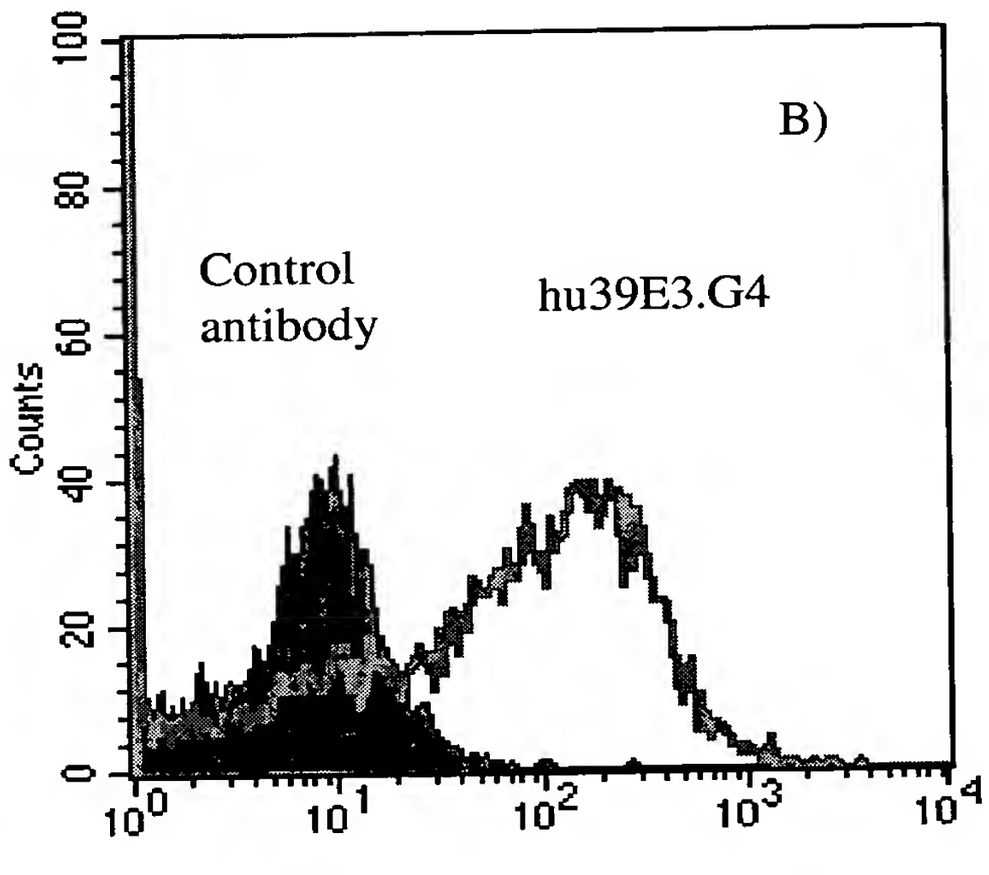
Control
antibody
B)
hu39E3.G4
Counts
0
20
40
60
80
100
10^0
10^1
10^2
10^3
10^4

FIG. 6B

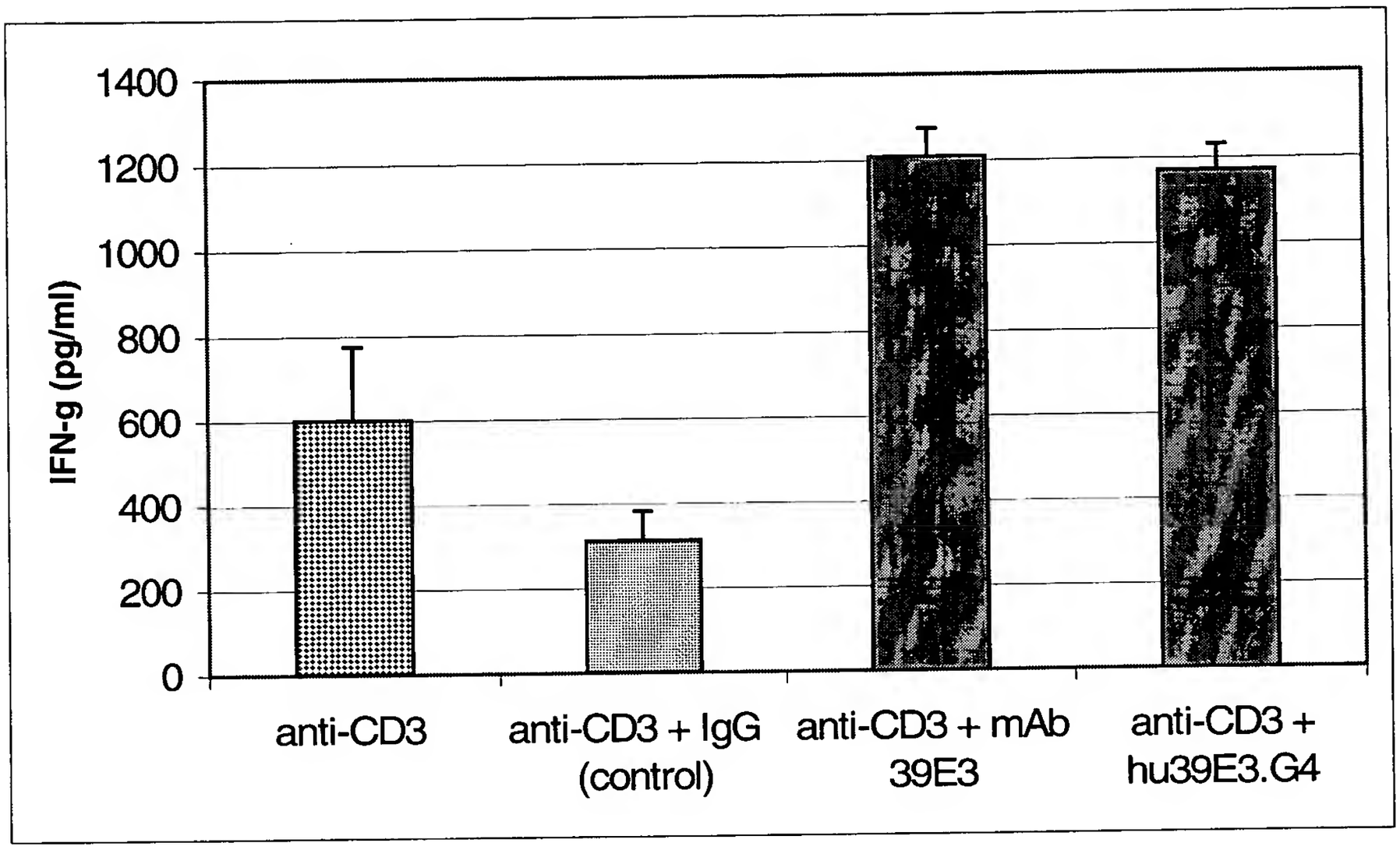
1400
1200
1000
800
600
400
200
0
IFN-g (pg/ml)
anti-CD3
anti-CD3 + IgG (control)
anti-CD3 + mAb 39E3
anti-CD3 + hu39E3.G4

FIG. 7

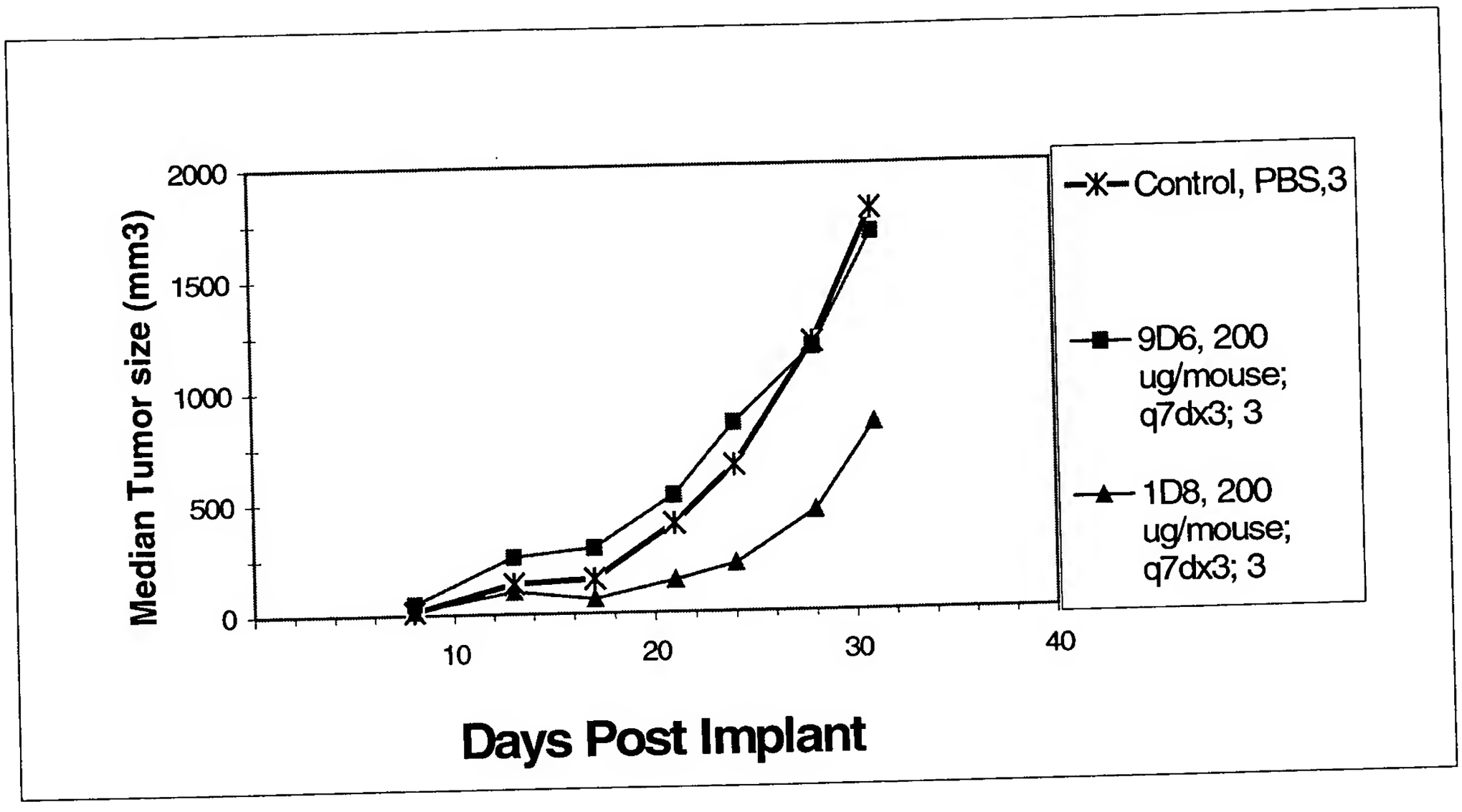
Median Tumor size (mm3)
2000
1500
1000
500
0
10
20
30
40
Days Post Implant
Control, PBS,3
9D6, 200 ug/mouse; q7dx3; 3
1D8, 200 ug/mouse; q7dx3; 3

FIG. 8A

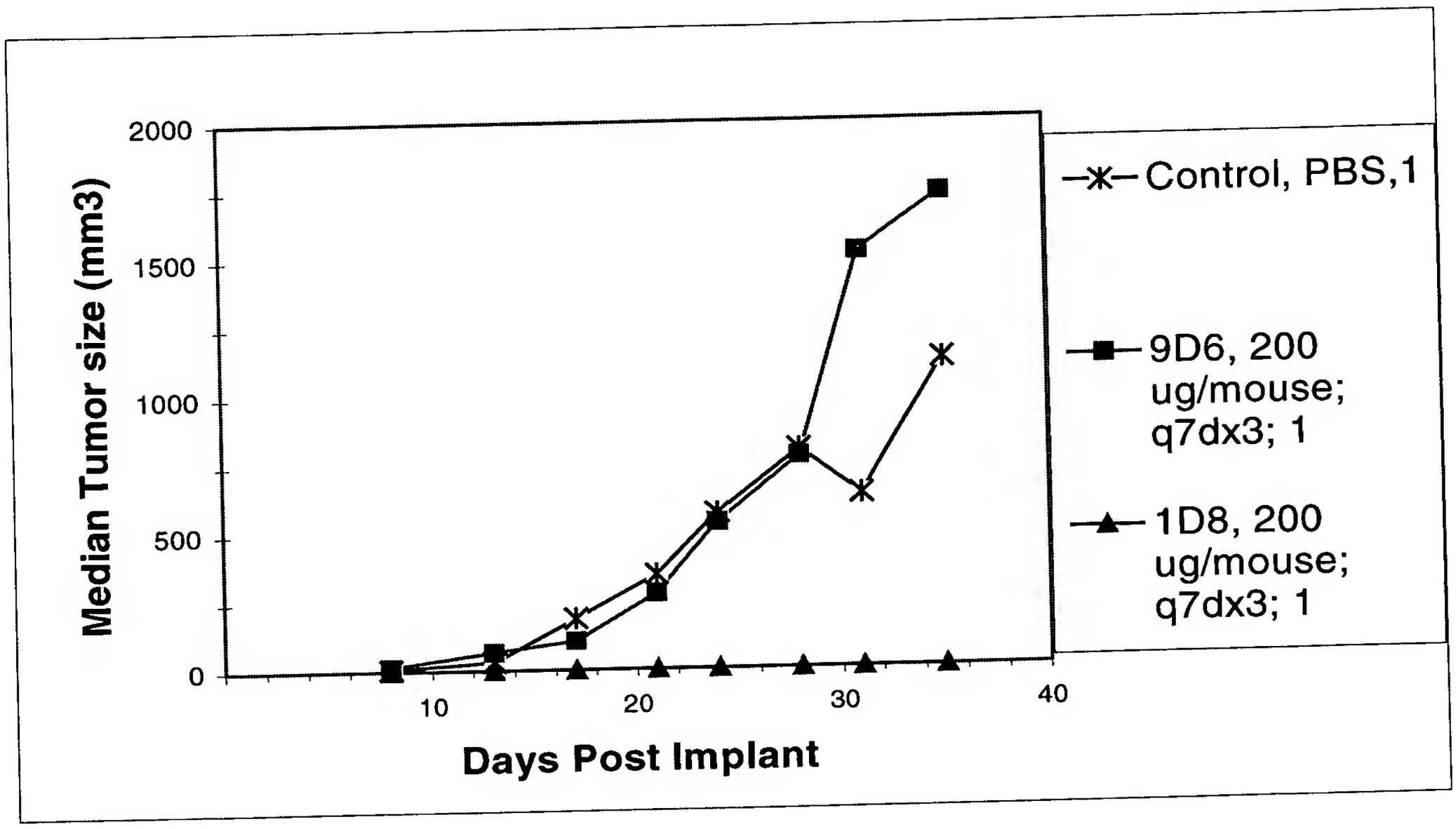
Median Tumor size (mm3)
2000
1500
1000
500
0
10
20
30
40
Days Post Implant
Control, PBS,1
9D6, 200 ug/mouse; q7dx3; 1
1D8, 200 ug/mouse; q7dx3; 1

FIG. 8B

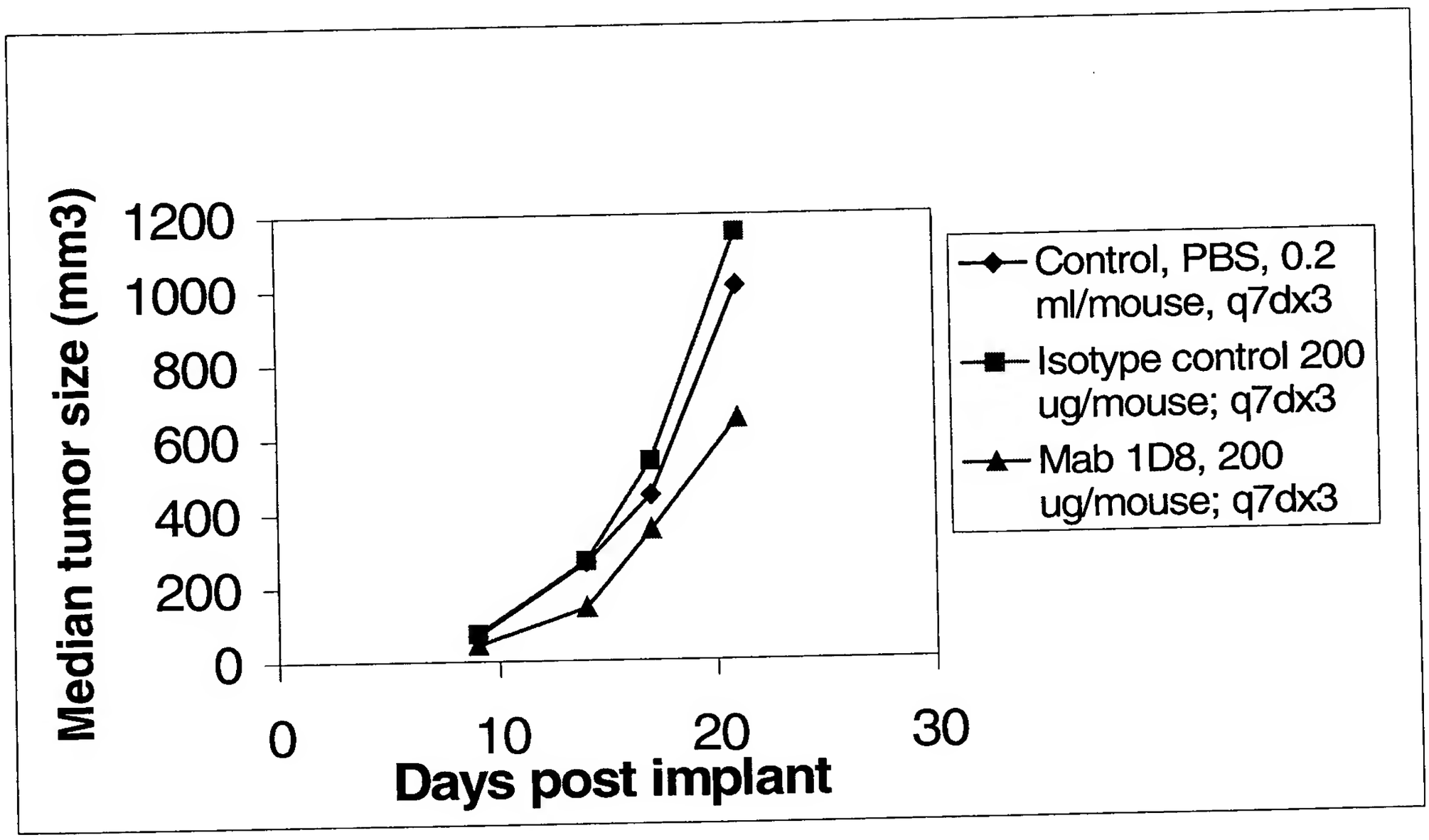
Median tumor size (mm3)
1200
1000
800
600
400
200
0
0
10
20
30
Days post implant
Control, PBS, 0.2 ml/mouse, q7dx3
Isotype control 200 ug/mouse; q7dx3
Mab 1D8, 200 ug/mouse; q7dx3

FIG. 9A

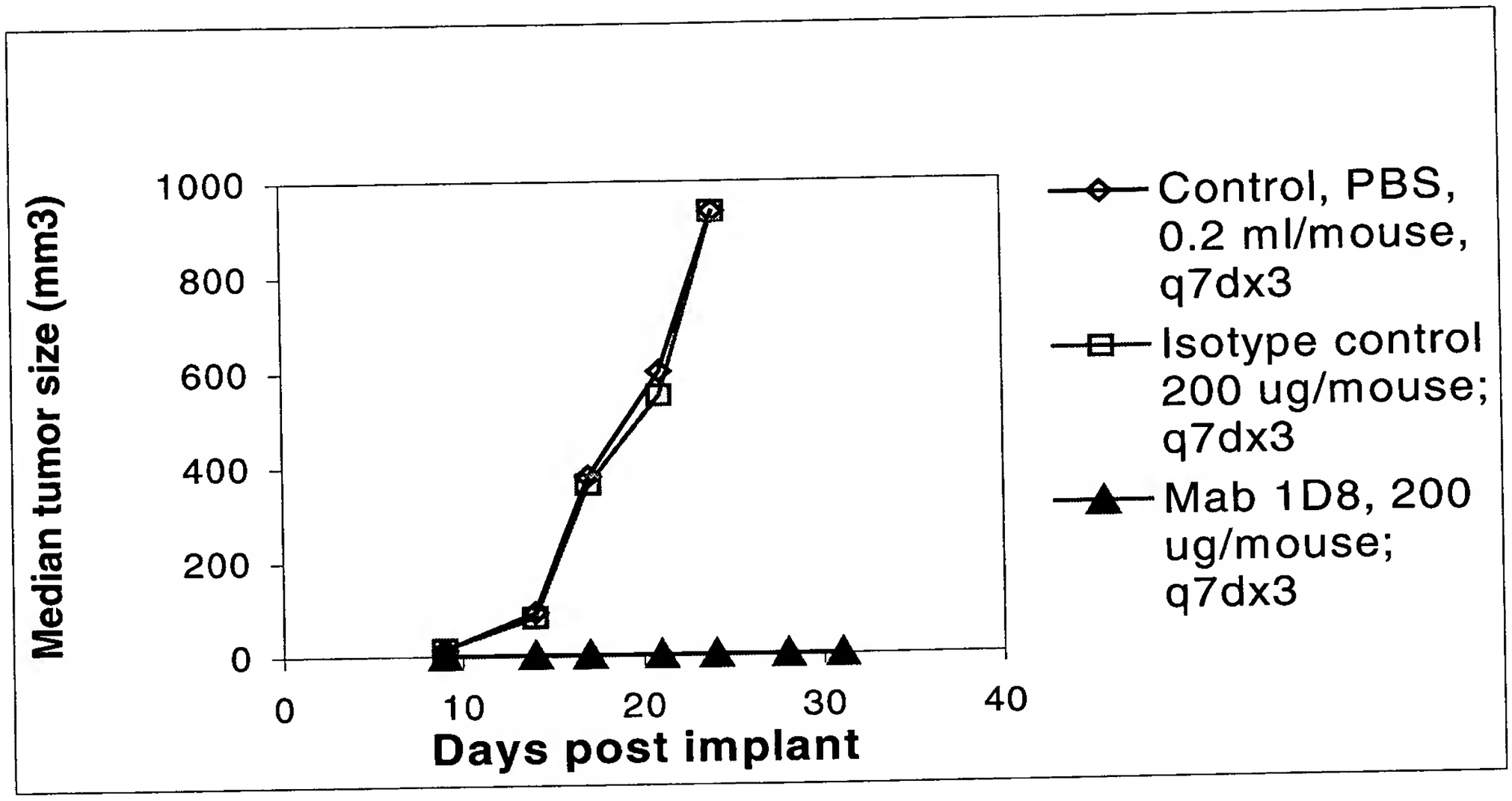
Median tumor size (mm3)
1000
800
600
400
200
0
0
10
20
30
40
Days post implant
Control, PBS, 0.2 ml/mouse, q7dx3
Isotype control 200 ug/mouse; q7dx3
Mab 1D8, 200 ug/mouse; q7dx3

FIG. 9B

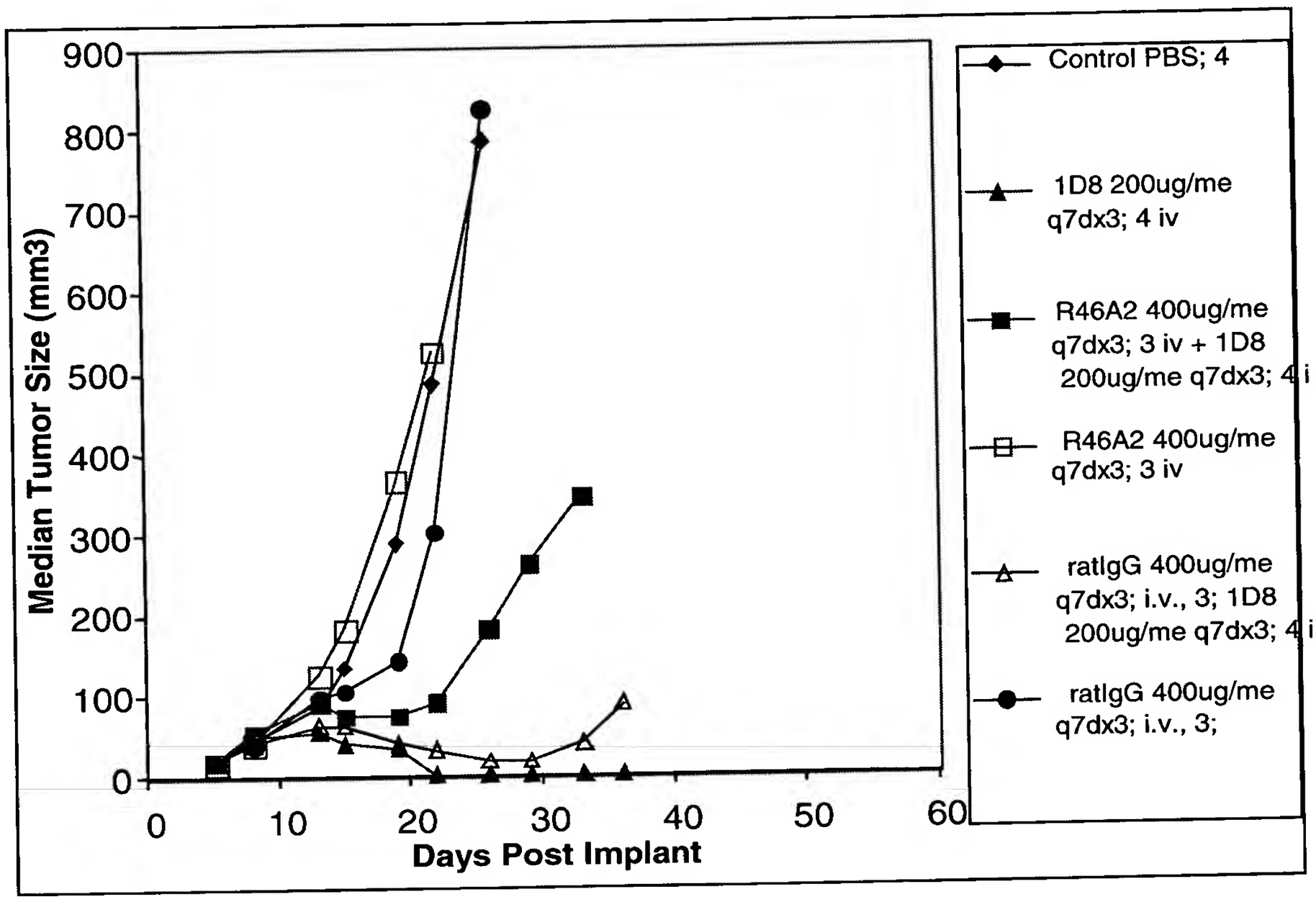
900
800
700
600
500
400
300
200
100
0
Median Tumor Size (mm3)
0
10
20
30
40
50
60
Days Post Implant
Control PBS; 4
1D8 200ug/me q7dx3; 4 iv
R46A2 400ug/me q7dx3; 3 iv + 1D8 200ug/me q7dx3; 4 i
R46A2 400ug/me q7dx3; 3 iv
ratIgG 400ug/me q7dx3; i.v., 3; 1D8 200ug/me q7dx3; 4 i
ratIgG 400ug/me q7dx3; i.v., 3;

FIG. 10